PART 4

ILLUSTRATED PEDIATRIC DENTISTRY

Editors:
Satyawan Damle
Ritesh Kalaskar
Dhanashree Sakhare

Bentham Books

Illustrated Pediatric Dentistry (Part 4)

Edited by

Satyawan Damle
Former Professor of Pediatric Dentistry,
Dean Nair Hospital Dental College,
Mumbai, India

Former Vice Chancellor,
Maharishi Markandeshwar University,
Mullana, Ambala, India

Ritesh Kalaskar
Department of Pedodontic and Preventive Dentistry,
Government Dental College & Hospital, Nagpur,
India

&

Dhanashree Sakhare
Founder, Lavanika Dental Academy
Melbourne
Australia

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FOREWORD 1

It is my great pleasure to pen down a foreword for this tremendous book on Pediatric Dentistry for a legend and doyen of the subject, a mentor and guide to the brightest of minds in the field of dentistry.

Rising from the fundamentals, comprehensive in-built, contemporary and authoritative in construct and approach, and hands-on to the core, ***Illustrated Pediatric Dentistry*** is a wonderful work engineered by some of the best-known academics in this noble realm. The chief author, ***Professor Satyawan Damle***, is a colossus among giants, having been a celebrated teacher, distinguished leader, and dynamic policymaker at several dental institutions and universities, including the most prized, the University of Mumbai.

Prof. Satyawan Damle is the rare blend of a gifted clinician and a carved-out academic guru whose intellect has emerged with decades of practice. It is no secret that the degree of acquisition of knowledge by students is one of the measures of the effectiveness of a medical curriculum; and with Pediatric Dentistry being one of the crucial epicentres of growth, it has the potential to make momentous advancements in the evolutionary trajectory of oral and general health.

His co-editors ***Ritesh Kalaskar***, and ***Dhanashree Sakhare*** are examples excellence in their arena. The work reflects their collective understanding of where pediatric dentistry stands today, what have been the treasures and well-kept secrets of the past, and where this tree of knowledge finds fruition today pawing way for the future.

Embedding best care practices of all times, ***Illustrated Pediatric Dentistry*** is a comprehensive yet concise work, which fulfills the essentials of the pediatric dentistry curriculum both for graduates and postgraduates across all universities.

Walking you through the nitty-gritties of preventive, curative and restorative childhood dentistry, be it the behavioral challenges, cariology, endodontics, traumatology, para-surgical themes such as the use of conscious sedation and general anaesthesia at that age, and the management of medically compromised children, the work is a tree of knowledge, nurtured with experiential learning, and carries wonderful blossoms of practical wisdom.

Let us savour and celebrate the chef-d'oeuvre. Indeed, ***Illustrated Pediatric Dentistry*** is a must-read and must-assimilate work for each one of us. Students, practitioners and teachers of Pediatric dentistry will cherish it as a treasured possession on their shelves. I congratulate Prof. Damle and Bentham Science, Singapore, for publishing this irreplaceable tome.

Prof. (Dr.) Mahesh Verma
Vice Chancellor
Guru Gobind Singh
Indraprastha University,
New Delhi,
India

FOREWORD 2

I am delighted to write this foreword for a Book of Illustrated Pediatric Dentistry authored by Professor Satyawan Damle and other academicians. Prof. Satyawan Damle is a well-known researcher and academician with over 44 years of clinical and teaching experience in Dentistry. Besides the several posts and hats he wore in the various roles he played for the profession, he is also a recipient of several awards and recognitions, including the Lifetime Achievement Awards, Outstanding Public Servant Awards, and Research Awards and Fellowships. He is an active member of the Indian Council of Medical Research. Despite his extraordinary achievements as a Pediatric dentist, researcher, and academician, Prof Satyawan Damle will always be known as the longest-serving chief editor of Indexed journals. For almost 35 years. He dedicated himself to overseeing the publication of the highest-quality peer-reviewed studies and opinion pieces on child dental health.

Prof. Damle is actively involved in writing several books on Pediatric Dentistry and Dentistry, which is the testimony of his in-depth knowledge of the subject. The Book of Illustrated Pediatric Dentistry is their new venture initiated by him. I am confident that this book will be accepted by students and faculty involved in teaching Pediatric Dentistry. His work as a teacher, researcher, innovator, visionary and extraordinary academician made him a legend. His role as a mentor and friend made him a role model to those of us who know him and worked with him. His legacy persists not only in academics but also as an able administrator, as he proved his mettle as the Dean of a dental school, Director of Medical Education, Joint Municipal.

Commissioner of Mumbai and, ultimately, the Vice Chancellor of a University. Prof. Damle has worked conscientiously and untiringly to present an unmatched educational endeavour. The topics in this book display a clear and succinct clinical expertise and the capability of imparting updated education and information to Oral Health Professionals. The entire volume of this book deals with ultramodern and current state-of-the-art techniques. I take this opportunity to congratulate Prof. Satyawan Damle and his team of contributors - Ritesh Kalaskar, and Dhanashree Sakhare for having published this Textbook for Bentham Sciences.

Dr. Ashok Dhoble. Hon. Secretary
General, Indian Dental Association H.O.
India

PREFACE

It is imperative to have an established approach to handling Children's oral diseases. **'Illustrated Pediatric Dentistry'** is an unpretentious endeavour to integrate the latest developments and up-to-date reviews in the field of Pediatric dentistry by distinguished writers. The book intends to allow students to understand the conceptions of Pediatric dentistry and create a spur to discover the subject by advance reading. Several illustrations, descriptions and graphic drawings have been included to attract the students and make the subject simple to comprehend. A healthy mouth is a gateway to a healthy body and the best time to inculcate healthy habits is through childhood. Prevention of the initiation of oral diseases and training appropriate oral hygiene methods are commenced best throughout the formative years of the child. With a substantial percentage of the worldwide population being in the Pediatric age group, it is imperious to have a scientific approach to behaviour management, prevention and treatment modalities in the dental office, as Pediatric dentistry is a fast-growing division of dental disciplines that lays the basis for the impending dental health of the populace.

The book has been divided into several sections. The sections on child psychology and the emotional development of children are important to learn the basics of various behaviour management strategies. The section on dental caries sensitizes the reader towards the most common dental disorder that is seen in children, and preventive procedures aimed towards lessening dental caries are the necessity of the hour. While an endeavour has been made to include the growth and development of the facial structures and dentition and along with their disturbances and the interceptive and preventive procedures to monitor the erupting teeth.

Pediatric Operative techniques, including endodontics and management of teeth with immature apices affected due to Dental caries and traumatic injuries have been given prominence. Innovations in the field of Pediatric Dentistry are transpiring amazingly fast, and it is crucial to stay up to date with the latest materials, equipment and techniques to deliver the highest quality of care to our little patients.

The New Book cannot be successfully compiled without the collective contribution regarding meticulous reviews of the manuscript to keep pace with the latest innovative novelties. The credit for introducing a New Textbook goes to the contributors for their engrossment, devotion and dedication in presenting a manuscript after applying prudent and well-adjudged scrutiny and analytical approach and have excelled in exploring things to the ultimate.

Accumulation of information and its cogent management would not have been conceivable without the efforts of the contributors who have painstakingly submitted their manuscripts to shape this gargantuan task and introduce this book in the service of Pediatric dentistry.

Satyawan Damle
Former Professor of Pediatric Dentistry,
Dean Nair Hospital Dental College,
Mumbai, India

Former Vice-Chancellor,
Maharishi Markandeshwar University,
Mullana, Ambala, India

Ritesh Kalaskar
Department of Pedodontic and Preventive Dentistry
Government Dental College & Hospital, Nagpur
India

&

Dhanashree Sakhare
Founder,
Lavanika Dental Academy,
Melbourne
Australia

ACKNOWLEDGEMENTS

We do not find such appropriate words to praise the unique nature of Dr. Mahesh Verma, Vice Chancellor of Guru Gobind Singh Indraprastha University, New Delhi, who himself being a great resolute and connoisseur of dentistry occupying an illustrious position with an eminent background in dentistry, has spared his valuable time from his busy schedule to inscribe the foreword for the Textbook of" Illustrated Pediatric Dentistry." We take it as inventiveness and encouragement rather than a morale-boosting for us to uphold and keep up our determination to satisfy our hunger for academics for the advantage of budding dental professionals.

We also do not find such befitting words to laud the unique nature of Dr. Ashok Dhoble Hon, General Secretary Indian, Dental Association Head Office, who himself is a great advocate and connoisseur of dentistry occupying a distinguished position with an illustrious background in dentistry has spared his precious time from his busy schedule to write the foreword for the Textbook of Illustrated Pediatric Dentistry. I take it as an inspiration and encouragement rather than a morale-boosting for us to uphold and keep up our determination to satisfy our hunger for academics for the advantage of budding dental professionals.

We are also indebted and beholden to the contributors for their altruistic and substantial contribution to make this Textbook of Illustrated Pediatric Dentistry, a great academic endeavour. The contributors are highly competent and knowledgeable clinicians known for their aptitude and capability, which have successfully recognized the most complex and convoluted details of each topic, duly integrating and blending the latest advancements and innovations in Pediatric Dentistry. They are a terrific hard worker and legendary luminaries known for their admirable accomplishments and remarkable involvement in dental education. They have made lots of efforts to lead things to excellence. Credit goes to these patrons and benefactors for the benevolent bequest of their vast knowledge and experience for the betterment of dental education.

We would also like to thank Dr. Priyanka Bhaje, Dr. Parag Kasar, Dr. Sharath Chandra, Dr. Prachi Goyal and Dr. Vidya Iyer for their painstaking efforts and intransigent toil during the editing of this book. They displayed exceptional patients, forbearance, and commitment during the preparation of the book Our dream has come true due to the support of our past and present students. Credit also goes to our family members for their tolerance, Love, and affection.

We would like to appreciate the efforts of Mrs. Humaira Hashmi & Mrs. Fariya Zulfiqar of Bentham Science for giving us an opportunity to pen down our ideas and academic work into reality. We also convey our kind and sincere appreciation to Pascali Pascalis.

Representative of Porter Instrument Business Unit of Parker Hannifin Matrx by Parker and Parker-Porter Product for permitting us to use the company products in our book.

Lastly, we would like to state that fortune favours those who defy complexities and overcome them on their own. We also passionately believe that Man is the architect of his own destiny, and God is on the side of those who toil and perspire to make their providence.

We place our sincerest admiration and gratitude to all those who have delightfully contributed to this cause and for their wishes and devotions made for understanding our dream.

Satyawan Damle
Former Professor of Pediatric Dentistry,
Dean Nair Hospital Dental College,
Mumbai, India

Former Vice-Chancellor,
Maharishi Markandeshwar University,
Mullana, Ambala, India

Ritesh Kalaskar
Department of Pedodontic and Preventive Dentistry
Government Dental College & Hospital, Nagpur
India

&

Dhanashree Sakhare
Founder,
Lavanika Dental Academy,
Melbourne
Australia

List of Contributors

Abdulkadeer Jetpurwala	Department of Pediatric Dentistry, Nair Hospital Dental College, Mumbai, India
Abi M. Thomas	Christian Dental College Ludhiana, Ludhiana, Punjab 141008, India
Alka Halbe	Breach Candy Hospital Trust, Mumbai, India
Alireza Mirzaei	RWTH Aachen University, 52062 Aachen, Germany
Amit Jain	Consultant Implantologist, Mumbai, India
Anahita Bagheri	RWTH Aachen University, 52062 Aachen, Germany
Andi Setiawan Budihardja	Department of Oral Maxillofacial Surgery, Faculty of Medicine, University of Pelita Harapan, Tangerang, Indonesia
Armelia Sari Widyarman	Department of Oral Biology, Faculty of Dentistry, Trisakti University, Jakarta, Indonesia
Bahman Seraj	Department of Pediatric Dentistry, Dental Faculty, Tehran University of Medical Science, Tehran, Iran
Bhagyashree Shetty	Junior Research Officer, Pune, India
Bhavna H. Dave	Department of Pediatric and Preventive Dentistry, K.M. Shah Dental College and Hospital, Sumandeep Vidyapeeth Deemed to Be University, Vadodara, Gujarat, India
Deepashri Meshram	Department of Oral and Maxillofacial Surgery, Nair Hospital Dental College, Mumbai, India
Devendra Nagpal	Department of Pediatric Dentistry, VSPM Dental College and Research Centre, Nagpur, India
Dhanashree Sakhare	Founder, Lavanika Dental Academy, Melbourne, Australia
Esha Kodal	Department of Anesthesiology, TNMC & BYL Nair Ch. Hospital, Mumbai, India
Falguni Shah	Lilavati hospital and Research Centre, Mumbai, India
Gholam Hossein Ramezani	Department of Pediatric Dentistry, Dental Faculty, Islamic Azad University of Medical Science, Tehran, Iran
Harsimran Kaur	Department of Pedodontics and Preventive Dentistry, Teerthanker Mahaveer Dental College and Research Centre, Moradabad, U.P, India
Jeddy	Department of Pediatric Dentistry, Faculty of Dentistry, Trisakti University, Jakarta, Indonesia
Mona Sohrabi	Department of Pediatric Dentistry, Qazvin University of Medical Sciences, Qazvin, Iran
Madulika Kabra	Division of Medical Genetics, Department of Pediatrics, AIIMS, New Delhi, India
N. Venugopal Reddy	Mamata Dental College & Hospital, Khammam, Telangana 507002, India
Naveen Manuja	Department of Pediatric and Preventive Dentistry, Kothiwal Dental College, Moradabad, India

Neeraj Gugnani	Department of Pediatric and Preventive Dentistry, DAV (C) Dental College, Yamuna Nagar, Haryana, India
Niraja Gupta	Division of Medical Genetics, Department of Pediatrics, AIIMS, New Delhi, India
Nilima Thosar	Department,of Pediatric and Preventive Dentistry, Sharad Pawar Dental College and Hospital, Datta Meghe Institute of Medical Sciences (Deemed to be University), Wardha-442107, India
Parag D. Kasar	Deep Dental Clinic, Navi Mumbai, Maharashtra 400706, India
Prachi Goyal	Department of Pediatric and Preventive Dentistry, MMCDSR, Mullana, Ambala, India
Pratik B. Kariya	Department of Pediatric and Preventive Dentistry, K.M. Shah Dental College and Hospital, Sumandeep Vidyapeeth Deemed to Be University, Vadodara, Gujarat, India
Ramakrishna Yeluri	Department of Pedodontics and Preventive Dentistry, Teerthanker Mahaveer Dental College and Research Centre, Moradabad, U.P, India
Razieh Jabbarian	Department of Pediatric Dentistry, Qazvin University of Medical Sciences, Qazvin, Iran
Rishika	Department of Pedodontics and Preventive Dentistry, Teerthanker Mahaveer Dental College and Research Centre, Moradabad, U.P, India
Sarita Fernandes	Department of Anesthesiology, TNMC & BYL Nair Ch. Hospital, Mumbai, India
Satyawan Damle	Former Professor of Pediatric Dentistry, Dean Nair Hospital Dental College, Mumbai, India Former Vice Chancellor, Maharishi Markandeshwar University, Mullana, Ambala, India
Shely P. Dedhia	Department of Pediatric and Preventive Dentistry, Nair Hospital Dental College, Madurai, Tamilnadu, India
Vidya Iyer	Ex Associate Professor, Department of Pediatric and Preventive Dentistry, CSI College of Dental Sciences, East Veli Street, Madurai, Tamilnadu, India
Vishwas Chaugule	Ex Professor, Department of Paediatric and Preventive Dentistry, Sinhgad Dental College and Hospital, Pune, India
Vishwas Patil	Ex Professor, Department of Paediatric and Preventive Dentistry, Dr. D.Y. Patil Dental College and Hospital, Pimpri, Pune, India

CHAPTER 1

Local Anesthesia in Pediatric Dentistry

Devendra Nagpal[1], Deepashri Meshram[2,*] and **Abdulkadeer Jetpurwala[3]**

[1] *Department of Pediatric Dentistry, VSPM Dental College and Research Centre. Nagpur, India*

[2] *Department of Oral and Maxillofacial Surgery, Nair Hospital Dental College, Mumbai, India*

[3] *Department of Pediatric Dentistry, Nair Hospital Dental College, Mumbai, India*

Abstract: Dental treatment has been associated with pain by adults and children alike. The fear associated with the perceived pain causes a lot of anxiety and is a common cause for patients to show avoidance towards basic dental care. A painless experience during dental treatment allows children to look forward to future dental appointments and allows the dentist to establish a good rapport with the child. Various agents are available for the administration of local anesthesia with lignocaine being the most common agent. As children have unique physiology and anatomic variations, the techniques for local anesthesia require minor modifications. Advances in local anesthesia materials and techniques have provided the dental surgeon to accomplish the goal of true painless dentistry.

Keywords: Dental Treatment, Lignocaine, Local Anesthesia, Pain.

INTRODUCTION

Local anesthesia is the temporary or reversible loss of sensation including pain in a specific part of the body produced by a topically applied or injected agent without depressing the level of consciousness. Providing a pain-free experience to children is the most important aspect of pediatric dentistry which helps to alleviate anxiety and instill a positive attitude towards dental treatment. Considering the innate fear of pain and injections in children it is all the more vital to carry out this key step in a child-friendly manner.

As with any anesthetic medical, dental, or surgical procedure, a careful and thorough preoperative evaluation must be conducted before the selection of technique and agents. This should include a review of medical history with special emphasis on past anesthetic experiences, a focused physical examination, determination of physical risk, and the potential for adverse drug interactions. The

[*] **Corresponding author Deepashri Meshram:** Department of Oral and Maxillofacial Surgery, Nair Hospital Dental College, Mumbai, India; E-mail: 24deemes@gmail.com

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patient's weight and body mass index are also important considerations. The historical perspective of local anesthesia has been shown in Table **1**.

Table 1. History of local anesthesia.

1859-60	**Albert Niemann was the first to isolate cocaine and discover its anesthetic properties**
1884	**Karl Koller introduced cocaine into clinical practice of medicine, using it as topical anesthetic for opthalmological surgical procedures**
1892	**Alfred Einhorn initiated the search and in 1905 for injectable local anesthetics**
1905	**Procaine (novocaine), the first injectable local anesthetic**
1948	**Introduction of Lidocaine**

Physiology of Nerve

Nerve – It is a cord-like bundle of fibers surrounded by a sheet that connects the nervous system with other parts of the body. The nerve conducts impulses towards and away from the central nervous system.

Neuron – It is a structural and functional unit of the nervous system.

Parts of Neurons

1. **The Cell body** – It contains the nucleus & other cell organelles.

2. **Dendrites** – It extends from the cell body & receives nerve impulses from the neurons.

3. **The Axon** – It is a long extension of the cell body that transmits nerve impulses to other cells.

The axon branches at the end, forming axon terminals. These are the points where neurons communicate with other cells.

Normal **depolarization** causes changes in the nerve membrane that allow for the passage of sodium ions through specific channels resulting in the propagation of action potential along the nerve.

An **action potential** is defined as a sudden, fast, transitory, and propagating change of the resting membrane potential. Only neurons and muscle cells are capable of generating an action potential and this property is called **excitability**.

There is a passage of an electrical impulse along the length of the axon. This flow of electricity is due to the movement of ions across the membrane of the axon. An

action potential travels down an axon causing a change in polarity across the membrane of the axon. In response to a signal from another neuron, sodium (Na^+) and potassium (K^+) gated ion channels open and close as the membrane reaches its threshold potential. Na^+ channels open at the beginning of the action potential and Na^+ moves into the axon, causing depolarization. Repolarization occurs when the K^+ channels open and K^+ moves out of the axon, creating a change in polarity between the intra and extracellular fluid. The impulse travels down the axon unidirectional to the axon terminal where it signals other neurons [1].

Five Phases of action potential (Fig. **1**):

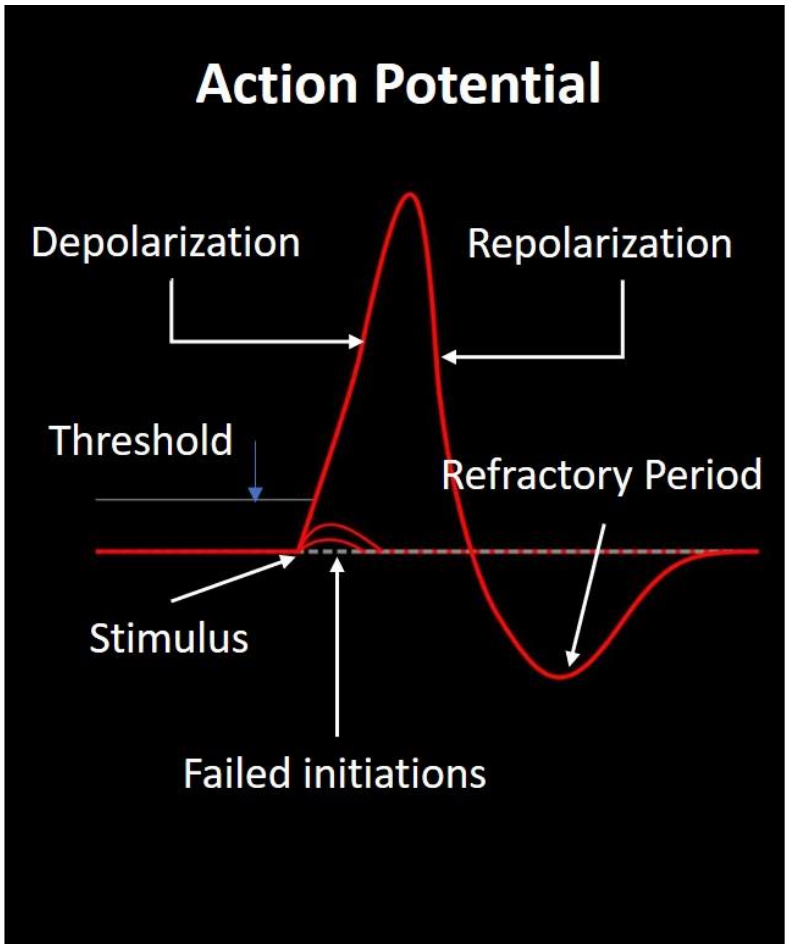

Fig. (1). Stages of nerve impulse.

1. **Rising Phase** – During this phase, the membrane potential depolarizes (becomes more positive).

CHAPTER 2

Extraction, Minor Oral Surgeries, and Implants in Children

Deepashri Meshram[1,*], Abdulkadeer M. Jetpurwala[2] and **Amit Jain[3]**

[1] *Department of Oral and Maxillofacial Surgery, Nair Hospital Dental College, Mumbai, India*

[2] *Department of Pediatric Dentistry, Nair Hospital Dental College, Mumbai, India*

[3] *Consultant Implantologist, Mumbai, India*

Abstract: Surgical procedures in children are often required for alleviation of pain, or removal of pathologic or aberrant entities from the oral cavity. The general principles for surgical management are relevant in children as well. Due to behavioural and cooperation problems in children the minor surgical procedures should be planned well, taking into consideration all aspects. Extraction of primary teeth must be commonly done due to extensive dental caries. Minor surgeries like cyst enucleations, frenctomies, mucoceles *etc.* require proper planning and execution for successful results.

The advent of dental implants has opened new vistas in rehabilitation of adult patients. However, the use of implants in pediatric dentistry has not been extensively used due to the growth and developmental changes in chidren. There is a limited scope for implants in dentistry hence it has been covered. If used judiciously implants can be an important addition to the field of work of pediatric dentists.

Keywords: Dental implants, Extraction of Primary teeth, Minor surgeries.

INTRODUCTION

Dental extractions are often required in children due to extensive caries, traumatic injuries or for guidance of eruption of the permanent teeth. The children and parents get equally anxious when face with the need for extractions or any surgical procedures in their children. Minor oral surgical procedures are the procedures of small duration and can be done under local anesthesia or in combination with LA and sedation or inhalational anesthesia. These procedures will always remain a challenge especially in pediatric patients due to the young age and lack of cooperation.

[*] **Corresponding author Deepashri Meshram:** Department of Oral and Maxillofacial Surgery, Nair Hospital Dental College, Mumbai, India; E-mail: 24deemes@gmail.com

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In pediatric dentistry minor procedures that can be carried out under local anesthesia are shown in Fig. (**1**):

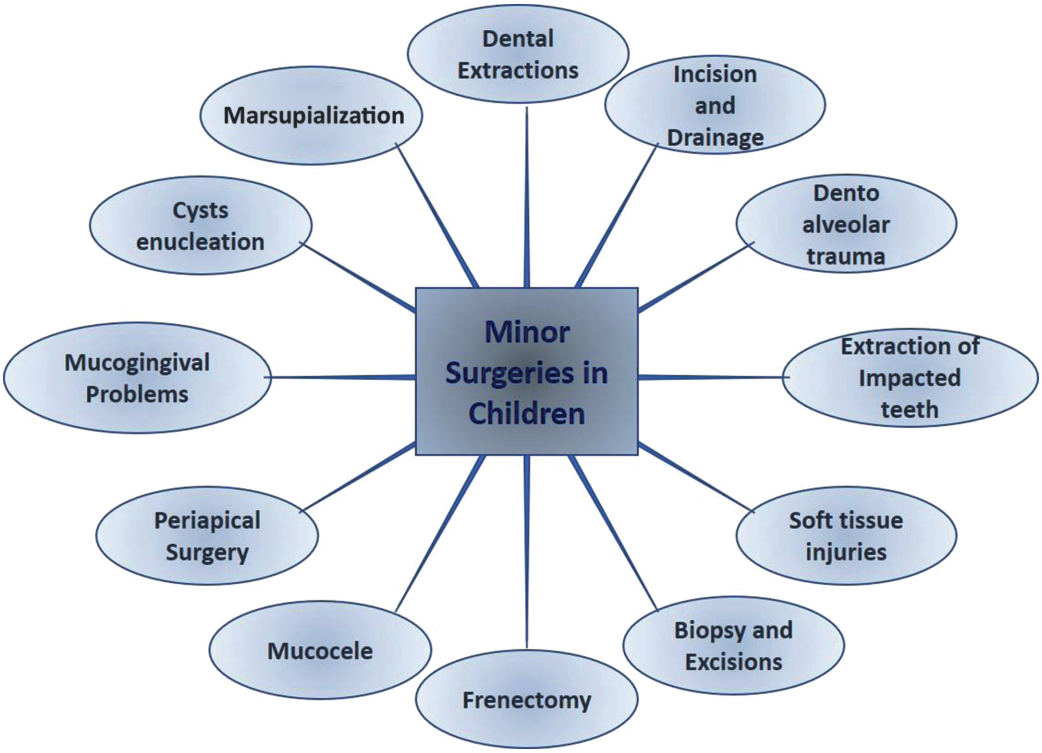

Fig. (1). Minor surgeries in children.

Preoperative Consideration

1. Informed consent

2. Medical evaluation

3. Dental evaluation

4. Growth and development

5. Behavioral evaluation

Peri and Postoperative Considerations

1. Pain and infection control

2. Metabolic management of children following surgery

3. Calorie intake

4. Fluid and electrolyte management

5. Blood replacement in case of blood loss.

Extraction of Erupted Teeth

Indications

Dental extractions are indicated in following:

1. Caries – extensive decay of the crown or root rendering the tooth non restorable

2. Periapical abscess

3. Failed pulpotomy or pulpectomy

4. Orthodontic correction

5. Over-retained teeth

6. Acute trauma

7. Root resorption

8. Serial extraction

9. Teeth associated with cyst and tumors of the jaw

Dental caries remains the most common reason for dental extraction and the first primary molars and maxillary central incisors are the most frequently extracted teeth.

Contraindications

Dental extraction has relative contraindications in following conditions and should be done carefully: -

1. Acute dental infection

2. Cyanotic congenital cardiac disorders

3. Blood dyscrasia

4. Bleeding and clotting disorders

CHAPTER 3

Sedation & General Anaesthesia in Pediatric Dentistry

Alka Halbe[1,*] and **Falguni Shah**[2]

[1] *Breach Candy Hospital Trust, Mumbai, India*

[2] *Lilavati Hospital and Research Centre, Mumbai, India*

Abstract: Managing a child for dental treatment is one of the most challenging tasks for both anaesthesiologists & pediatric dentists alike. The goal is to provide safe, painless, anxiety-free, prompt & appropriate treatment in the minimum number of sessions. To achieve this, children need to be given Monitored Anaesthesia Care (MAC), Sedation, Anxiolysis or sometimes complete general anaesthesia (GA) by appropriately trained specialists in day-care & ambulatory services settings with better advances in anaesthesia, dentistry, pharmacology, monitoring devices, better understanding of paediatric airway anatomy & physiology, paediatric dental anaesthesia has become safe over the last few years. This chapter overviews the various aspects of Pediatric dental anaesthesia & sedation and highlights the significance of specialised infrastructure, personnel, & protocols.

Keywords: General Anaesthesia, Nitrous Oxide, Pediatric Dental Anaesthesia, Sedation.

INTRODUCTION

Managing children for various dental procedures in free-standing ambulatory clinics or hospitals. Careful & sensitive planning of the system & anaesthesia, if necessary, is vital to develop a positive attitude towards dental treatment [1]. Depending on the child's emotional maturity, physical, psychological & mental ability & skills, the usual behavioural control techniques may or may not offer adequate efficacy & safety for dental treatment [2].

There are various reasons for stress, fear & anxiety in children, exposure to strange environments, noises of mechanical dental instruments, injections pain,parents' visible stress, and parental separation [3]. In these situations, alter-

* **Corresponding author Alka Halbe:** Breach Candy Hospital Trust, Mumbai, India; E-mail: arhalbe@breachcandyhospital.org

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nate & more invasive methods like sedation or GA (general anaesthesia) may be necessary for optimum treatment.

Objectives of Sedation & Anaesthesia

1. Patient Safety- "**primum non Nocera***"* ("first, do no harm")

2. Control of anxiety, fear, and psychological trauma

3. Pain control and amnesia of the event

4. Movement restrains

5. Minimise oral secretions

6. Patient and operator comfort so that procedure is completed successfully & in a minimum number of sessions.

Different Methods of Sedation and Anaesthesia for Paediatric Dental Treatment

Behaviour management can be pharmacological or non-pharmacological in paediatric dental patients [1]. However, some children may need sedation or GA during dental treatment due to their inherent anxiety, fear, nature & length of treatment, various congenital or acquired medical conditions *etc.* Noticeably young children perceive any kind of stimulus as pain and keeping them quiet in a dental chair to complete the procedure safely & adequately becomes difficult. Thus, the anaesthesia requirement in pediatric dental patients may vary from monitored anaesthesia care (MAC) to sedation to general anaesthesia (GA) [4].

Challenges for anaesthesia care providers in dental practice is regarding sharing the airway with the pediatric dentist. The patient's ability to control the airway may be impaired due to pharmacological override of normal protective airway reflexes like swallowing& coughing. This increases the chances of blood, water, saliva, and dental debris aspiration. The level of analgesia and sedation needs to be controlled carefully as inadequate sedation will increase secretions, may cause masseter spasms or clenching and more primitive reflexes like laryngospasm can be activated [1]. Untreated or prolonged laryngospasms can result in hypoxia &long-term brain damage or even death in rare cases. Deeper levels of sedation may precipitate respiratory depression, airway obstruction, if it goes unnoticed, may culminate into hypoxia and hypercarbia, leading to long term morbidity and rarely even mortality.

Stimulating the trigeminal nerve during the dental procedure under lighter planes of sedation or anaesthesia may be implicated in the increased incidence of ventricular arrhythmias. This incidence may be exacerbated by accompanying hypoxia, hypercarbia, and the presence of inhalational anaesthetic agents like halothane. Local infiltration can significantly reduce this incidence [5].

Non-Pharmacological Methods of Behavior Management

Nonpharmacologic methods include behavioural and cognitive approaches like a distraction, desensitisation, relaxation, reinforcing and strengthening positive behaviour. These procedures complement pharmacologic interventions; however, sedation or GA may not be needed in some mature children if these methods are adequate.

Parental presence in the treatment room helps ease anxiety and improve cooperation. Besides baby, when allowed to remain in the arms of the mother, venepuncture or mask acceptance becomes more manageable. However, anxious parents can transfer their anxiety to the child, and parents can be a hindrance [6]. For older children playing music through headphones, video games, video, or virtual reality goggles works well as a distraction technique. Subsequent visits also become more accessible, and the sedation requirement goes down. It is worth a try [7 - 9].

Pharmacological Methods

Procedural sedation has become the standard of care for managing pain and anxiety in children in the dental chair and for short diagnostic and therapeutic procedures in children outside the operation theatre. The increasing grades of sedation ultimately lead to GA like state. The American Academy of Pediatrics (AAP), the American Society of Anaesthesiologists (ASA), the American Academy of pediatric dentistry, and the Joint Commission use the following definitions to describe the depth of sedation [7, 8].

1. Analgesia- Pain relief with or without altered mental status due to the drug's effect.

2. Minimal Sedation is a state of depression of the central nervous system in which cognitive function and coordination may be impaired. It enables treatment to be carried out without losing verbal contact with the patient. Patients retain their protective airway reflexes and cardiovascular functions. It's a state of 'Anxiolysis'.

CHAPTER 4

Drugs Used in Pediatric Dentistry

Abdulkadeer M. Jetpurwala[1], Shely P. Dedhia[1,*] and **Vidya Iyer[2]**

[1] *Department of Pediatric and Preventive Dentistry, Nair Hospital Dental College, Mumbai, India*

[2] *Ex Associate Professor, Department of Pediatric and Preventive Dentistry, CSI College of Dental Sciences, East Veli Street, Madurai, Tamilnadu, India*

Abstract: Children are in a state of delicate physiologic equilibrium and, unlike adults, are more susceptible to medications and their adverse effects. Medicines used for children should be carefully selected, and the minimum dose required should be administered. Possible adverse reaction in multidrug therapy is also essential. The pediatric dentist must also consider any other drug the child may be taking while prescribing drugs and understanding children's presenting signs and symptoms.

Keywords: Analgesics, Antibiotics, Antifungal, Antimicrobials, Non-steroidal anti-inflammatory drugs.

INTRODUCTION

Children are more prone to infections because of their developing immune systems. The oral cavity is one such area where various bacterial, viral, and fungal infections are generally encountered, making using antimicrobials and analgesics mandatory. The oral cavity is also a zone of inflammatory responses from the gingival and periodontal tissues, and anti-inflammatory drugs are commonly prescribed for dental diseases.

Antimicrobials are substances that kill or suppress the growth or multiplication of microorganisms. Along with combating infections, managing pain is inherent to dental practice. Numerous analgesics are available, and the recent introduction of new agents provides even more options from which to choose while prescribing these drugs; it is essential and should be considered that children are not just "small adults." Children go through different stages of development, which variations in body weight, surface area, physiology, kidney function, liver,

* **Corresponding author Shely P. Dedhia:** Department of Pediatric Dentistry, Nair Hospital Dental College, Mumbai, India; E-mail: jetabdulkadeer@yahoo.com

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cognitive or immune function. This, in turn, influences the impact of drugs on the pharmacokinetic/ pharmacodynamics of their body.

Most children report to the dental office with the chief complaint of pain or swelling about the teeth or surrounding structures. The most typical cause of dental pain is an odontogenic infection caused by dental caries or trauma. In such emergencies, the primary emphasis should be given to pain relief and control of the underlying disease. Hence, a pedodontist/ dental professional needs to know the dosage and side effects of drugs used in different conditions [1].

Calculation of Pediatric Dose [2]

The dose of drugs used in children varies from adults, primarily concerning age, metabolic activity, body surface area and excretory capacity of the child.

The appropriate dose of the drug for children can be calculated by the following formulae, depending on the child's age, weight, or body surface area, relating to the average adult dose.

Young's Rule

Dilling's Rule

Fried's Rule

Clarke's Rule

According to the Body Surface Area

Non-Steroidal Anti-Inflammatory Drugs [3]

Human beings have undoubtedly experienced pain since the beginning of time. From historic fossils to writings of ancient civilisations, evidence of pain and attempt at its relief has been noticed throughout history. Nonsteroidal anti-inflammatory drugs (NSAIDs) are commonly prescribed in dental practice to manage pain and swelling.

Nonsteroidal anti-inflammatory drugs are also called non-opioid analgesics. These drugs have some common actions, such as, Fig. (**1**).

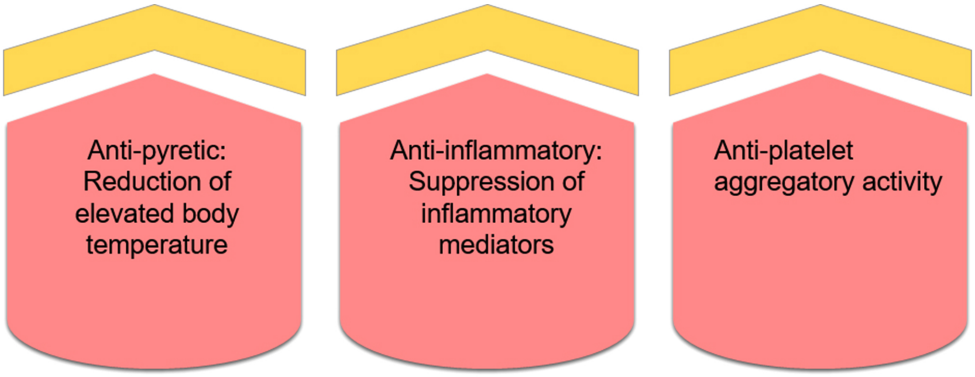

Fig. (1). Actions of nonsteroidal anti-inflammatory drugs.

Analgesia: Pain Relief (Without Interfering with Opioid Receptors)

Classification

Nonsteroidal anti-inflammatory drugs are classified according to their potential to cyclo-oxygenaseygenase (COX) enzyme during arachidonic acid metabolism (Table **1**) [4].

Table 1. Classification of nonsteroidal anti-inflammatory drugs.

Type	Examples
Nonselective COX inhibitors	
Salicylates and their congeners	Acetyl salicylic acid (Aspirin), Salicylamide
Para amino phenol derivatives	Phenacetin, Paracetamol
Pyrazolone derivatives	Phenylbutazone, Oxyphenbutazone
Indoles and related drugs	Indomethacin, Sulindac
Aryl acetic acid derivatives	Diclofenac
Pyrrolo pyrrole derivatives	Ketorolac
Propionic acid derivatives	Ibuprofen, Ketoprofen
Anthralin acid derivatives	Flufenamic acid, Mefenamic acid
Oxicams	Piroxicam
Preferential COX2 inhibitors	Nimesulide, Meloxicam, Nabumetone
Selective COX2 inhibitors	Rofecoxib, Valdecoxib, Etoricoxib, Celecoxib

CHAPTER 5

Management of Children with Systemic Diseases

Bahman Seraj[1,*], Gholam Hossein Ramezani[2], Razieh Jabbarian[3], Mona Sohrabi[3] and **Alireza Mirzaei[4]**

[1] *Department of Pediatric Dentistry, Dental Faculty, Tehran University of Medical Science, Tehran, Iran*

[2] *Department of Pediatric Dentistry, Dental Faculty, Islamic Azad University of Medical Science, Tehran, Iran*

[3] *Department of Pediatric Dentistry, Qazvin University of Medical Sciences, Qazvin, Iran*

[4] *RWTH Aachen University, 52062 Aachen, Germany*

Abstract: Significant oral problems are associated with many medical disorders. Close cooperation and consultation between the dentist and the child's physician are essential to render optimum medical care. Prevention of oral disease is the primary consideration for these children. Medically compromised children can be challenging to treat and affect dental care [30]. To treat medically compromised patients safely, it is essential to Obtain a relevant and thorough medical history and understand the possible implications of the illness on dental treatment and the potential importance of the condition on treatment planning and the caries risk associated with the medical condition. With advances in medical treatment, significantly more children survive longer with more complex medical needs, and these children will present to the general dentist for dental treatment.

Keywords: Children, Compromised Patient, Dental Management, Emergency, Medical Disorders, Systematic Diseases.

INTRODUCTION

Medically compromised patients are individuals with any physical, developmental, mental, sensory, behavioural, cognitive, or emotional disability. Their effective participation in society can be limited due to individual disorder and environmental barriers. These patients are at risk for tooth decay and other oral diseases due to various factors such as compromised immunity, financial obstacles for parents, difficulty in maintaining oral health due to sensory or motor disorders and aversion to dental treatment (Figs. **1** & **2**). Oral diseases are among the most prevalent ailments among these disabled children worldwide, and dental

* **Corresponding author Bahman Seraj:** Department of Pediatric Dentistry, Dental Faculty, Tehran University of Medical Science, Tehran, Iran; E-mail: erajbah@as tums.ac.ir

care is the greatest unattended health need of these disabled. Therefore, these patients have a low oral health-related quality of life (OHRQoL). The psychological reactions associated with a disability affects the disabled, parents, caregivers, and family members. Lack of awareness of the parents of these children about the importance of oral health, health care system, stress and unique concerns of their parents, and limited financial resources available are the reasons for delays in the assessment and treatment of oral health of these children. For this reason, in many cases, home care is so neglected that they require extensive dental treatment. Therefore, raising parental awareness is a critical issue. The role of a dental professional is also vital in the rehabilitation of these patients in the social environment. This specialist should be fully aware of these patients' systemic, extraoral and intraoral signs and symptoms and how to treat them but should also be aware of multidisciplinary areas so that, if necessary, these patients can be treated after consultation with other specialists.

Fig. (1). A South African Child of mixed ancestry heritage, aged four years with CHARGE syndrome.

Fig. (2). Plaque accumulation and mild to moderate gingival hyperplasia are evident. The incisal edge of her anterior incisor was chipped, and there was a fusion of her 81 and 82.

1) Respiratory system

1-1) Asthma
1-2) Bronchopulmonary dysplasia
1-3) Cystic fibrosis

2) Cardiovascular system

2-1) congenital heart disease
2-2) Acquired heart disease

3) Circulatory system

3-1) Hemophilia A
3-2) VonWillbrand Disease
3-3) Sickle cell anaemia

4) Immune system

4-1) AIDS
4-2) Leukemia
4-3) Hematopoietic stem cell transplantation

5) Gastrointestinal system

5-1) Crohn's disease
5-2) Celiac disease

CHAPTER 6

Management of Special Children

Bhavna H. Dave[1,*] and **Pratik B. Kariya**[1]

[1] *Department of Pediatric and Preventive Dentistry, K.M. Shah Dental College and Hospital, Sumandeep Vidyapeeth Deemed to Be University, Vadodara, Gujarat, India*

Abstract: Patients with a spread of medical conditions, some unknown to them, ask for dental treatment. Usually, this can often be mixed with the intake of a posh variety of medicines. Dental management aims to produce safe and effective treatment while not causative a medical crisis. Consequently, dental treatment might be changed to keep with the patient's medical constraints, and occasionally, MD consultation can be required. Information of the medical standing of patients obtained through correct medical history-taking is key to safe patient management. The health profile of a country's population is additionally relevant for the supply of oral health care. However, there's a scarceness of data regarding the medical standing of patients seen. This chapter throws lightweight on the consecutive management of dental patients with medical emergencies with this read.

Keywords: Blood Coagulation Disorders, Children, Dental Management, Diabetes Complications, Drug Hypersensitivity, Emergency Treatment, Medical Emergencies, Metabolic Disease, Myocardial Ischemia Therapy.

INTRODUCTION

Individuals with special health care needs are at greater risk for oral diseases throughout their lifetime. Oral diseases are of significant concern due to their direct and devastating impact on the health and quality of life of those with specific systemic health problems. Such individuals have unique needs and require oral health care of a special nature. Familiarity with the patient's medical history is essential. It decreases the risk of aggravating a medical condition while rendering dental care [1].

[*] **Corresponding author Bhavna H. Dave:** Department of Pediatric and Preventive Dentistry, K.M. Shah Dental College and Hospital, Sumandeep Vidyapeeth Deemed to Be University, Vadodara, Gujarat, India; E-mail: bhavnadave1964@gmail.com

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Pre- Appointment Preparation (Table-1)

a. Acquiring a thorough health history

b. Understand the significance of the disease that the patient may endorse.

c. Consult with the child's primary care physician

d. History of medications

e. History of allergies

Assessment of the Medically Compromised Patient

Table 1. Assessment of the medically compromised patient.

Complete Health History	Assessment and management tools
• Date of Last Physical Examination. • Name, Address and Contact number of Specialists. • List of Medical conditions being treated. • List of medications. • Allergies and Medical emergencies experienced. • Hospitalizations.	• Complete blood count (CBC) with Plat. Count and white blood cells (WBC diff). • Prothrombin time (PT)/ international normalised ratio (INR). • Partial thromboplastin time (PTT); BT. • Liver function tests (LFTs) • Hepatic Serology, Serum Creatinine. • Fasting blood sugar test (FBS). • Postprandial glucose test PP and glycated haemoglobin (HbA1C). • CD4 count and Viral Load.

Note: At each visit, the history should be consulted and updated. Caries- risk assessment should be performed periodically [2].

Various Medical Conditions

- Cardiovascular diseases
- Pulmonary diseases
- Hematological disorders
- Endocrine disorders
- Hepatological Diseases
- Neurological disorders
- Immunological disorders

Management of Patients with Cardiovascular Diseases

Management implications in oral health care depend mainly on intervention and cardiovascular risk (Table **2**). The anxiety and pain associated with dental care can cause enhanced sympathetic activity and adrenaline (epinephrine) release, increasing the heat load and the risk of angina or arrhythmias.

Table 2. Grading of hypertension and dental management considerations.

American Society of Anesthesiologists (ASA) grading of hypertension and dental management considerations			
Blood pressure (mmHg) (Systolic, diastolic)	ASA Grade	Hypertension Stage	Dental aspects
<140, <90	I	–	Routine dental care Recheck BP before Starting regular dental Care.
140–159, 90–99	II	1	
160–179, 95–109	III	2	Recheck BP and seek medical advice before Routine dental care Restrict use of adrenaline (epinephrine) Conscious sedation may Help
>180, >110	Iv	3	Recheck BP after 5 min Quiet rest medical advice before Dental care Only emergency care Until BP controlled Avoid vasoconstrictors

Before any procedure, it is crucial to note down the vital (Fig. **1**). The constant monitoring of the vitals is necessary. Various modalities to be followed, especially for dental management, are there for different cardiac conditions (Table **3**).

Fig. (1). Recording Vitals before the dental procedure for a patient with congenital heart disease.

Management of Patients with Endocrinology Diseases

The endocrine system is widespread and consists of glands that exert their effects through chemicals (hormones) secreted into the blood circulation. Hormones are chemical messengers of various types, which usually act at some distance from

CHAPTER 7

Cleft Lip and Palate in Children: Classification and Treatment

Andi Setiawan Budihardja[1,*], Armelia Sari Widyarman[2] and **Jeddy [3]**

[1] *Department of Oral Maxillofacial Surgery, Faculty of Medicine, University of Pelita Harapan, Tangerang, Indonesia*

[2] *Department of Oral Biology, Faculty of Dentistry, Trisakti University, Jakarta, Indonesia*

[3] *Department of Pediatric Dentistry, Faculty of Dentistry, Trisakti University, Jakarta, Indonesia*

Abstract: Orofacial clefts are one of the most common head and neck birth defects worldwide, affecting children of all socioeconomic and cultural backgrounds. Orofacial clefts refer to a cleft lip and palate, a complex trait caused by multiple genetic and environmental factors. Children with orofacial clefts commonly have various issues, such as learning difficulties, speech and language disorders, middle ear abnormalities, psychosocial problems, and dental abnormalities. Due to the complex nature of a cleft lip/palate, the treatment involves interdisciplinary teams, including plastic surgeons, pediatric dentists, maxillofacial surgeons, orthodontists, and speech therapists. Dental and orthodontic procedures are required at an early age (9 months to one year of age) to aid normal facial and dental development and prepare the patient for surgery later. The main treatment goals in cleft lip and palate cases are to maintain the natural anatomical form of the lips and palate to ensure everyday speech without hypernasality. An additional goal is to ensure normal psychosocial development.

Keywords: Birth defects, Cleft lip, Cleft palate, Dental abnormalities, Orofacial clefts, Psychosocial development.

INTRODUCTION

Orofacial apertures, which can affect the lips, alveolus, palate, or a combination of these, are one of the most common abnormalities of the head and neck in pediatric populations worldwide. Most cases involve the palate and lips [1]. The prevalence of orofacial clefts is around 1 in every 700 births. The number varies in different countries, with a higher number in the United States (1 in 1,000 infants) and Asian countries. This congenital disability is also more common in particular populations (*e.g.*, Native Americans). Hearing and speech impairment, dentition, and psychosocial problems are common among patients with orofacial clefts [2].

[*] **Corresponding author Andi Setiawan Budihardja:** Department of Oral Maxillofacial Surgery, Faculty of Medicine, University of Pelita Harapan, Tangerang, Indonesia; E-mail: abudihardja79@gmail.com

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Restoring the function and esthetics of the palate and lips in infants with orofacial clefts requires surgery performed by a skilled surgeon.

Cleft Lip

A cleft lip or cheiloschisis is a deformity of the upper lip at birth. In infants with a cleft lip, what is not closed? A cleft lip can be unilateral (complete or incomplete) or bilateral (Figs. **1** - **3**) [1, 2].

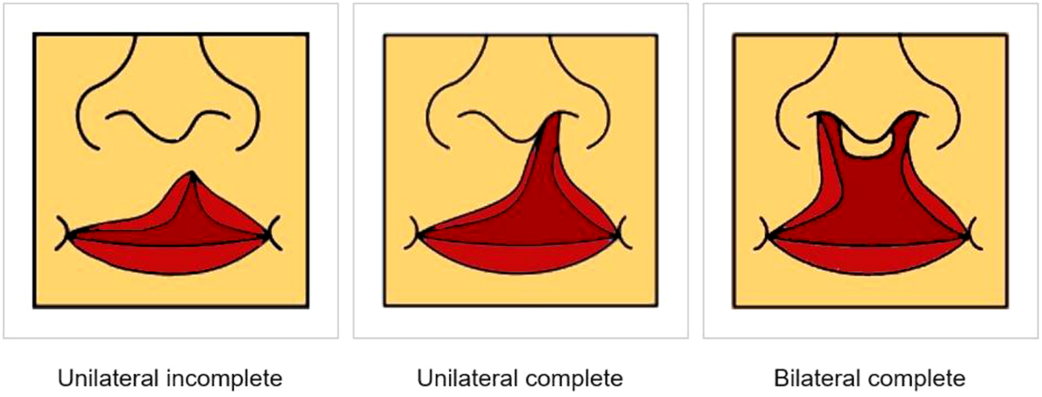

Fig. (1). Types of cleft lips.

Fig. (2). An infant with a complete unilateral cleft lip and palate.

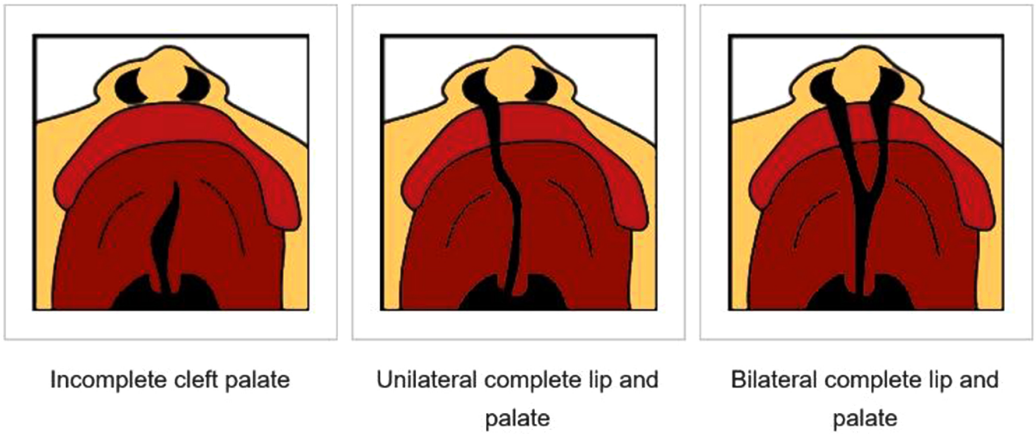

Fig. (3). Types of cleft palate.

Cleft Palate

A cleft palate or palatoschisis is a birth abnormality where an opening or split in the upper lip, split in the roof of the mouth (palate), or both, due to insufficient tissue that connects the whole lip (Fig. **3**). Clefts can be called complete, incomplete, or forme fruste (*i.e.*, involving only muscle). Clefts on the middle of the lip, alveolar bone, or palate (hard or soft palate) are known as "typical' clefts" [1].

Cleft Lip and Cleft Palate Classification

Veau was the first to classify a cleft lip/palate in 1931 [3 - 5]. Veau classified a cleft lip as what exactly. Table **1** and Fig. (**4**) show the cleft palate classes according to Veau.

Table 1. Classification of cleft palate by Veau [3].

CLASS	DESCRIPTION
CLASS I	Cleft only on the soft palate
CLASS II	A cleft on the soft and hard palate
Class III	A cleft on the soft and hard palate and alveolus (unilateral)
CLASS IV	A cleft on both soft and hard palate and alveolus (bilateral)

CHAPTER 8

Medical Emergencies in Children Introduction

Sarita Fernandes[1,*] and **Esha Kodal**[1]

[1] *Department of Anesthesiology, TNMC & BYL Nair Ch. Hospital, Mumbai, India*

Abstract: A medical emergency is a serious concern in the dental office. It may lead to a life and death situation, and prompt early response has a profound effect on the morbidity and mortality of the patient. A dental surgeon is expected to be a first responder in any medical emergency until appropriate medical help arrives. The office staff should be adequately trained and assigned proper individual roles in an emergency to ensure a smooth and efficient response. They should have basic knowledge of resuscitation and drugs used in emergencies. The dental clinic should be equipped with a basic armamentarium and drugs cart.

Keywords: Basic Life Support, Dental Office, Emergency Drugs, Medical Emergency.

The term **'emergency'** indicates urgency and points to a situation that may become life-threatening if not managed immediately. The mandate is to 'prevent and prepare' rather than 'repent and repair.' A detailed medical questionnaire documenting the birth and developmental history, past and present medical illnesses, surgical or dental procedures performed, and hospitalisation needed is mandatory. There are situations when a referral to the pediatrician may be required to ensure that the child is in an optimal state of health to tolerate the stress of the dental procedure. Even if all precautions are taken, emergencies may still occur. Knowledge of the pathophysiology and management of these conditions and resuscitation skills will help avert catastrophe

It is mandatory to document baseline vital signs before the dental treatment. They serve as a baseline reference value for comparison in an adverse event.

Temperature: The various sites for measuring body temperature include: the oral cavity, axilla, rectum, ear canal and over the temporal artery. The standard

* **Corresponding author Sarita Fernandes:** Department of Anesthesiology, TNMC & BYL Nair Ch. Hospital, Mumbai, India; E-mail: drsaritar@yahoo.com

expected range of temperatures checked at various locations have been summarised in Table **1**.

Table 1. Normal temperature at various anatomical locations according to the age of the patient.

Age	Oral	Rectal	Axillary	Ear
0-2years	-	97.9-100.4 °F	94.5-99.1 °F	97.5-100.4 °F
3-10years	95.9-99.5 °F	97.9-100.4 °F	96.6-98.0 °F	97.0-100.0°F
>11years	97.6-99.6 °F	98.6-100.6 °F	95.3-98.4 °F	96.6-99.7 °F

Average temperature by age and mode of measurement, along with the cut off value over which the patient is considered to have a fever, has been given in Table **2**.

Table 2. Cut-off value over which patient is considered febrile.

Fever	Celsius	Fahrenheit
Oral Cavity	More than 37.5 °C	More than 99.5°F
Axilla	More than 37.2 °C	More than 99 °F
Rectum	More than 38.0 °C	More than 100.4 °F

A thermometer should be kept in situ for 3-5mins for surface and 1-2min for core temperature (rectal and oral). Digital thermometers used to measure oral and axillary temperature results in 45 secs to 1min. Presently non-contact, infra-red digital thermometers are used for assessing the patient's temperature (Fig. **1**).

Fig (1). Digital non-contact Infra-red thermometer.

Pulse

The pulse may be palpated in places that allows the arteries to be compressed against bone.

Wrist (Radial Artery) (Fig. **2A**, **B**).

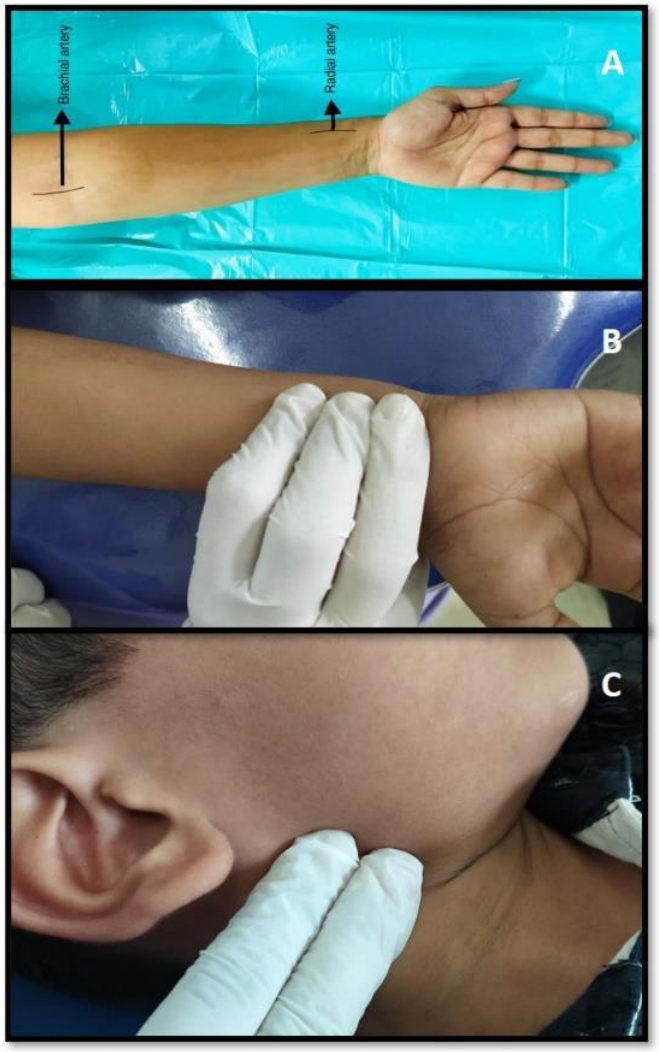

Fig. (2). Location of the brachial and radial artery; B- Radial pulse; C-Carotid pulse.

Antecubital fossa (Brachial Artery) (Fig. **2A**, **B**)

Behind the knee (Popliteal Artery)

CHAPTER 9

Oral Manifestations and Management of HIV/ AIDS in Children

Satyawan Damle[1,*], Abdulkadeer Jetpurwala[1] and **Dhanashree Sakhare[2]**

[1] *Department of Pediatric Dentistry, Nair Hospital Dental College, Mumbai, India*

[2] *Lavanika Dental Academy, Melbourne, Australia*

Abstract: Children are innocent victims of HIV infection. Children who are HIV positive, either through mother-to-child transmission or following sexual abuse, are often not revealed what could happen to them. They will undoubtedly be worried when they experience symptoms.

It has been estimated that 90% of people with HIV infection present at least one oral indication at some time during the disease. The presence of oral lesions may be an early diagnostic indicator of HIV/AIDS. Early recognition, diagnosis and treatment of HIV associated oral lesions in children can reduce morbidity and improve the quality of life of children who have HIV/AIDS.

Keywords: AIDS, Children, Candidiasis, HIV, Infection.

INTRODUCTION

The origin of the Human Immunodeficiency Virus (HIV) has been a subject of scientific research and debate since the virus was identified in the 1980s. There is now a wealth of evidence on how, when and where HIV first began to cause illness. HIV is a type of lentivirus that attacks the immune system. Similarly, the Simian Immunodeficiency Virus (SIV) attacks the immune systems of monkeys and apes. The research discovered that HIV is related to SIV, and there are many similarities between the two viruses. HIV-1 is closely related to a strain of SIV found in chimpanzees, and HIV-2 is closely related to a strain of SIV found in sooty mangabeys [1].

[*] **Corresponding author Satyawan Damle:** Department of Pediatric Dentistry, Nair Hospital Dental College, Mumbai, India; E-mail: sgdamle@gmail.com

HISTORY

How did HIV cross from chimps to humans?

The most accepted theory is that of the 'hunter'. In this scenario, SIVcpz was transferred to humans because of chimps being killed and eaten or their blood getting into cuts or wounds on people while hunting. Usually, the hunter's body would have fought off SIV, but on a few occasions, the virus adapted itself within its new human host and became HIV-1. There are four main groups of HIV strains (M, N, O and P), each with a slightly different genetic make-up. This supports the hunter theory because every time SIV passed from a chimpanzee to a human, it would have developed slightly within the human body and produced a different strain. This explains why more than one strain of HIV-1 [2]. The most studied strain of HIV is HIV-1 Group M, which is the strain that has spread throughout the world and is responsible for most HIV infections today (Figs. **1A** and **B**).

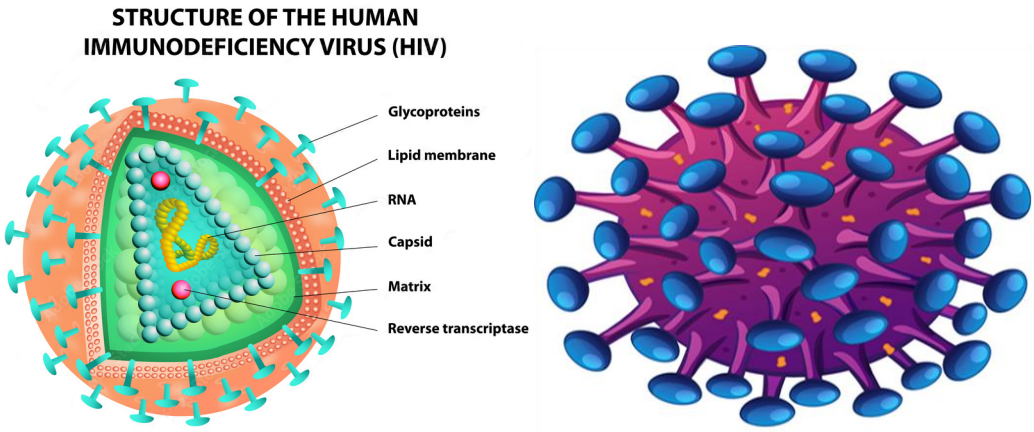

Fig. (1). A and **B**: Structure of Human Immunodeficiency Virus.

When and Where did HIV Start in Humans?

Studies of some of the earliest known samples of HIV provide clues about when it first appeared in humans and how it evolved. The first verified case of HIV is from a blood sample taken in 1959 from a man living in what is now Kinshasa in the Democratic Republic of Congo. The sample was retrospectively analysed, and HIV detected. There are numerous earlier cases where patterns of deaths from common opportunistic infections, now known to be AIDS-defining, suggest that HIV was the cause, but this is the earliest incident where a blood sample can verify infection. It is far rarer and less infectious than HIV-1. As a result, it infects far fewer people and is found in a few countries in West Africa like Mali, Mauritania, Nigeria, and Sierra Leone [3].

2018 Global HIV Statistics

HIV continues to be a significant global public health issue. In 2018, an estimated 37.9 million people were living with HIV (including 1.7 million children), with a global HIV prevalence of 0.8% among adults. Around 21% of these same people did not know that they had the virus [3]. Since the start of the epidemic, an estimated 74.9 million people have become infected with HIV, and 32 million people have died of AIDS-related illnesses. In 2018, 770,000 people died of AIDS-related illnesses. This number has reduced by more than 55% since the peak of 1.7 million in 2004 and 1.4 million in 2010 [1]. Most people living with HIV are in low- and middle-income countries, with an estimated 68% living in sub-Saharan Africa. Among this group, 20.6 million live in East and Southern Africa, which saw 800,000 new HIV infections in 2018 [3]. • There has been significant success in reducing the number of new HIV infections among children since 2000. However, for children living with HIV, AIDs-related illnesses are still among the leading causes of infant mortality.

HIV/AIDS Scenario in Children

Although prevention of mother-to-child transmission programmes is successful when implemented, there needs to be a more significant scale-up of coverage and increasing early infant diagnosis after birth and during breastfeeding.

More needs to be done to support the prevention of HIV among vulnerable children and to address the unique antiretroviral treatment adherence challenges that affect children living with HIV.

Approximately 90% of pediatric HIV infections are acquired from infected mothers resulting in vertical transmission for infants. HIV also can pass from mother to child during pregnancy (30-35%), childbirth (60-65%), or breastfeeding (10-15%). Globally, the annual number of new infections among children (0-14 years) has almost halved since 2010, with a 47% reduction in new HIV cases [4]. Since 1995, an estimated 1.6 million new HIV infections among children have been averted due to providing antiretroviral medicines (ARVs) to women living with HIV during pregnancy and breastfeeding. Most of these infections (1.3 million) were averted between 2010 and 2015 [5].

Despite this significant progress, the number of children becoming newly infected with HIV remains unacceptably high. In 2016, 24% of pregnant women living with HIV did not have access to ARVs to prevent transmission to their infants. Around 160,000 children became infected with HIV; this equates to 438 children a day.

CHAPTER 10

Advances in Pediatric Dentistry

Harsimran Kaur[1,*], **Rishika** [1] and **Ramakrishna Yeluri**[1]

[1] *Department of Pedodontics and Preventive Dentistry, Teerthanker Mahaveer Dental College and Research Centre, Moradabad, U.P., India*

Abstract: Approaches for managing dental caries have changed dramatically in recent years, evolving from froadichtional treatments to a preventive approach. Modern management approaches aim to prevent the disease, manage the caries risk, and detect caries lesions as early as possible. Also, various breakthroughs have been made in restorative materials to improve their biocompatibility and bonding with tooth structure. With nanotechnology, knowledge of materials, and developments in biomaterials, the prod the action of the best quality dental restorative materials is rising. Local anaesthesia is the standard and the backbone for controlling pain. The introduction of newer techniques of regional anaesthesia and delivery devices assist dentists in providing enhanced pain relief with reduced pain from injection and fewer adverse reactions. The chapter below highlights the various advancements in sterilisation, diagnostic aids, preventive strategies, restorative materials and techniques and tissue engineering.

Keywords: Diagnostic Aids, Endodontics, Local Anaesthesia, Restorative materials, Tissue engineering.

INTRODUCTION

With the remarkable advent of advancement in all fields of medicine, pediatric dentistry did not remain an exception. Dentistry has gone from “extension for prevention” to “constriction with conservation”. These transformations have caused a paradigm shift in the pediatric population's treatment planning and management of Oro-dental problems. A few of these innovations in pediatric dentistry are discussed below.

[*] **Corresponding author Harsimran Kaur:** Department of Pedodontics and Preventive Dentistry, Teerthanker Mahaveer Dental College and Research Centre, Moradabad, U.P., India; E-mail: Simran2871@Gmail.Com

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ADVANCES IN STERILIZATION

Selecting the appropriate method to process with the products used in health care delivery is vital to ensure that pathogens triggering infections are not transmitted to patients and vice versa. The quality of managing the situation is the foundation of curbing diseases associated with specific procedures through the microbial reduction or destruction in products used and the maintenance of a product's functionality and integrity.

• Ozone Sterilization

O_3 is present in the environment naturally *via* oxygen in the stratosphere by absorbing the sun's ultraviolet radiation. When O_3 is obtained through electrochemical technology, it is an alternative for breaking down resistant organic compounds, such as dyes from textile effluents, pesticides, and waste from the paper industry. The practices recommended for health workers concerning the sterilisation of health products assume that O_3 is a strong oxidant, enabling the construction of an effective low-temperature sterilisation system.

Mechanism of Action of Ozone

Antimicrobial Effect.

- Causes cell death by local damage of cytoplasmic membrane due to ozonolysis of double bonds, ozone-induced modification of intracellular contents.
- Oxidize many organic compounds, causes circulatory enhancement metabolism, and stimulate oxygen metabolism. Enhanced antimicrobial activity in a liquid environment of the acidic pH.
- Oxidation of NADH (Nicotinamide Adenine dinucleotide) and NADPH Hydrogenated Nicotinamide Adenine Dinucleotide phosphate coenzymes, manifested in all three metabolic pathways, *i.e.*, involving carbohydrates, proteins, and fats [1].

Advantages of Ozone Sterilisation

- It is cost-effective.
- It does not require inputs because oxygen is used to produce O_3.
- Diffusion of O_3 in lumens of various diameters and lengths rigid stainless steel has also been proved.

The application of O_3 as a sterilising agent for products used in health care is a new proposition; the scope and products tests and the diversity of experiments imply that research on O3 as sterilising agent is still developing.

ADVANCES IN DIAGNOSTIC AIDS

Conventional methods cannot detect carious lesions until a relatively advanced stage. Thus, there has been intensive research into more sophisticated methods for the early detection of dental caries over the past few years. Several are in their infancy, and there is significant work involved in developing these techniques. The following section presents a brief description of the neoteric caries diagnostic methods.

Digital Dental Mirror (Mirror Scope)

It has a loupe and microscope combined in a ready to use manner. It has the advantage that it can be used to capture videos or still images, just like an intraoral camera. The clinicians can choose to work directly from the mirror or indirectly view high-resolution images magnified up to 30-x. The Mirror Scope will enable the operators to provide better patient care while improving their posture and reducing back and neck strain (Fig. **1**) [2].

Fig. (1). Digital Dental Mirror.

CHAPTER 11

Management of Non-cavitated and Cavitated Carious Lesions

Neeraj Gugnani[1,*], Naveen Manuja[2] and **Parag D. Kasar[3]**

[1] *Department of Pediatric and Preventive Dentistry, DAV (C) Dental College, Yamuna Nagar, Haryana, India*

[2] *Department of Pediatric and Preventive Dentistry, Kothiwal Dental College, Moradabad, India*

[3] *Deep Dental Clinic, Navi Mumbai, Maharashtra 400706, India*

Abstract: Carious lesions can range from early, non-detectable mineral loss, restricted to enamel, through to lesions that extend into dentine without any surface cavitation, to cavitated lesions, which destroy the tooth tissue and can be visible as cavities in the teeth. Cavitated caries lesions generally are non-cleansable and thus active; therefore, these lesions most commonly need to be restored. Selective removal of carious tissues is guided by the depth of the lesion, pulpal health, and choice of dental material. Fluoride is the cornerstone of the non-invasive management of non-cavitated caries lesions. Still, its ability to promote net remineralisation is limited by the availability of calcium and phosphate ions. Ideal remineralisation material should diffuse or deliver calcium and phosphate into the subsurface lesion or boost the remineralisation properties of saliva and oral reservoirs without increasing the risk of calculus formation. These options are often no longer feasible for carious lesions where the tooth tissue surface has become cavitated, as the biofilm is sheltered and cannot be easily removed or manipulated. In such situations, invasive (restorative) options are required. With the advent of adhesive restorations and facilitated by the described changing understanding of the pathogenesis of caries and carious lesions, a paradigm shift in restorative dentistry occurred. In asymptomatic, vital teeth with deep lesions, conservative carious tissue removal strategy,s that reduce tissue loss and pulp exposure risk must be balanced against removing adequate tissue to maximise restoration longevity. In two stages, the most recent inspiration for stepwise carious removal originates from the knowhow on Intra lesion changes in deep carious lesions. Natural enamel and dentin are still the best "dental materials" in existence; therefore, minimally invasive procedures that conserve a more significant part of the wild, healthy tooth structure must be considered desirable. Ultraconservative dentistry represents a significant step forward for the dentist, the profession, and especially the patient. A changing understanding of the disease of dental caries has initiated a paradigm shift in the management of carious lesions. Instead of merely removing the symptoms of the carious lesion, any treatment aims to manage the disease.

[*] **Corresponding author Neeraj Gugnani:** Department of Pediatric and Preventive Dentistry, DAV (C) Dental College, Yamuna Nagar, Haryana, India; E-mail: Simran2871@Gmail.Com

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Keywords: Cavitated Lesion, Demineralisation, Dental Caries, Fluoride, Minimally Invasive Dentistry, Non-cavitated Lesion, Stepwise Excavation of Caries, Remineralisation, Restoration, The Death Spiral of Teeth, Ultraconservative Treatment.

INTRODUCTION

Dental caries is the most prevalent disease worldwide, with billions of individuals affected by the resulting burden of pain, loss of function, impaired aesthetics, and speech. The oral microbiota is organised on dental hard tissues as biofilms; Under healthy conditions, these biofilms contain limited numbers of cariogenic bacteria (including streptococci and lactobacilli statendition of dental caries) caused by a shift in the oral microbiota composition towards increased proportions of cariogenic bacteria. The imbalance in the biofilm results in a discrepancy in the mineral loss and gain, with a resulting net mineral loss. If this continues over time, it can lead to the development of a carious lesion as the symptom of the caries disease process [1].

Carious lesions can range from early, non-detectable mineral loss, restricted to enamel, through to lesions that extend into dentine without any surface cavitation, to cavitated lesions, which destroy the tooth tissue and can be visible as holes in the teeth [1].

Traditionally, all carious lesions have been treated by removing all demineralised or affected and bacterially contaminated (infected) dentine and reputilising utilising restorations (for example, amalgam or composite), commonly known as a 'filling'. However, the pathophysiology of the disease process shows that carious lesions can be controlled by altering the factors leading to net mineral loss. This can be achieved by reducing carbohydrate intake; removing or controlling the biofilm activity, sealing the tooth surface from the environment; or rebalancing demineralisation and remineralisation, for example, by applying fluoride [1].

Caries lesions can be classified into two categories: non-cavitated and cavitated.

Non-Cavitated Caries Lesions

A non-cavitated caries lesion (also sometimes referred to as an early lesion, an incipient lesion, or a white spot lesion) is a demineralised lesion without evidence of cavitation. As the lesion progresses, the outer surface, which is in contact with dental plaque and is protected by the salivary pellicle, is exposed to cycles of demineralisation and remineralisation, and it regains some minerals (including fluoride) and becomes less prone to further demineralisation. Non-cavitated lesions in pits and fissures may appear as a white, yellow, or brown discolouration

(or a combination of these colours), which may be limited to the confines of the pits and fissures may extend from the pit-and-fissure system. Exceedingly early lesions are visible only after air drying. More advanced lesions are visible when the tooth is wet or dry [2].

Cavitated Caries Lesions: (Fig. 1)

Cavitated lesions are lesions that have progressed to a more advanced stage. Cavitation usually occurs because of external forces that eventually lead to the collapse of the outer surface in a non-cavitated lesion, leading to a discontinuity or break in the surface. The gap in the surface may be limited to the enamel, or it may expose the dentin [2].

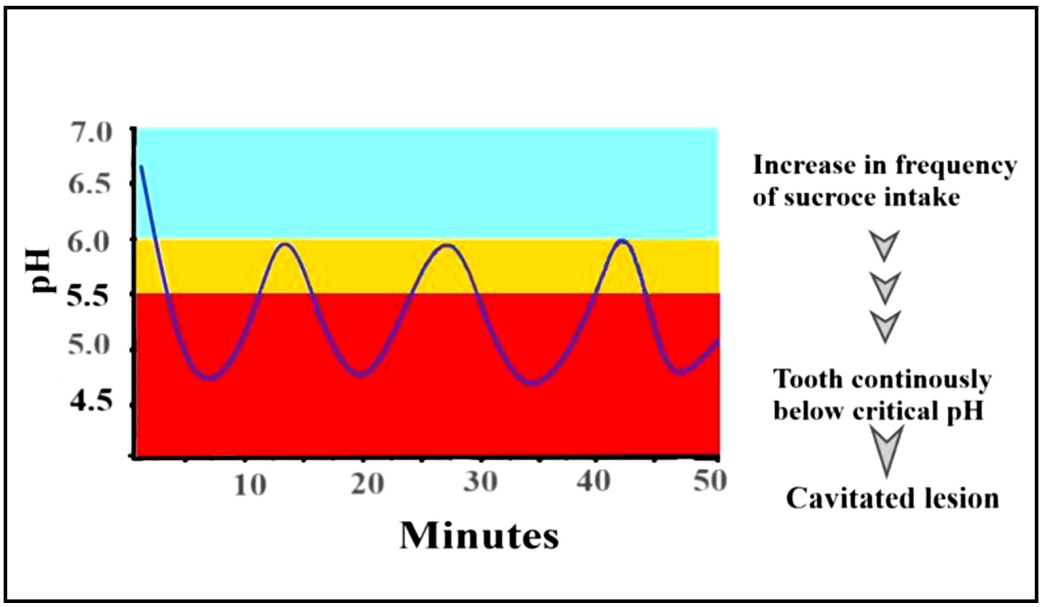

Fig. (1). Stephan Curve Showing Formation of a Cavitated Lesion.

The International Caries Detection and Assessment System (ICDAS) is a clinical scoring system used to detect and assess dental caries. This scoring system can be used on coronal surfaces and root surfaces. To detect and evaluate these lesions, it can be used for enamel caries, dentine caries, non-cavitated lesions, and cavitated lesions detect and estimate these lesions.

The international caries detection and assessment system (ICDAS) was developed to provide clinicians, epidemiologists, and researchers with an evidence-based approach to permit standardised caries detection and diagnosis in different environments and situations.

CHAPTER 12

Lasers in Pediatric Dentistry

Gholam Hossein Ramezani[1,*], **Alireza Mirzaei**[2] and **Anahita Bagheri**[2]

[1] *Department of Pediatric Dentistry, Dental Faculty, Tehran University of Medical Science, Tehran, Iran*

[2] *RWTH Aachen University, 52062 Aachen, Germany*

Abstract: In recent years, the desire of Dental Clinicians and patients to use lasers for the treatment of Dental conditions has increased. Knowledge of laser functions and biological features of oral tissues is crucial for understanding the effect of dental lasers. Choosing a suitable dental laser for different tissues effectively reduces tissue damage. Other types of lasers are used in dentistry, which effectively treats lesions by providing innovative and minimally invasive treatments that also have biostimulation, anti-inflammatory, and analgesic effects. Among lasers, erbium lasers, being less invasive and having caries removal properties, have been optimally considered in pediatric dentistry. Lasers in children can also have efficient antiseptic effects on vital and non-vital pulp therapies of primary teeth.

One of the most common oral problems in children is dental trauma. Laser-based therapies can significantly reduce pain and surgical problems. Laser therapy is a suitable and valuable treatment strategy in children despite surgery problems and provides practical health solutions. Findings have shown that different lasers, based on their wavelength, can cause incisions on the soft and hard tissues of the mouth and teeth in the form of various mechanisms such as vaporisation or ablation, and these effects vary according to the wavelength used; however, choosing an infrared laser allows the dentist to better interact with specific targets such as gums, mucous membranes, and mouth injuries. This chapter examines the critical effects of lasers in pediatric dentistry.

Keywords: Erbium Laser, Lasers , Treatment of Caries, YAG Lasers.

[*] **Corresponding author Gholam Hossein Ramezani:** Department of Pediatric Dentistry, Dental Faculty, Tehran University of Medical Science, Tehran, Iran; E-mail: gh.h.ramezani@gmail.com

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INTRODUCTION

Pediatric Laser Dentistry

Since dental caries and untreated dental problems can severely affect children's general health and well-being, dental care and treatment are crucial. However, there is ample evidence that the children and adolescents suffer from various oral diseases, such as oral mucosal lesions. Many physicians confront children who are afraid of the unknown and do not cooperate with the physician and Dental clinicians, which can create challenges for dental professionals in providing therapeutic care. Therefore, familiarity with children's psychological, behavioural, and physical needs is necessary. In this case, the role of modern and new technologies such as lasers cannot be denied. Light has been used as a therapeutic agent for many years. Nowadays, lasers are used in many cases in various fields of medicine and surgery and can replace knives in dental surgery. The word LASER stands for light amplification by stimulated emission of radiation. A laser is a one-way, single-colour electromagnetic energy that allows high-energy light beams to be transmitted and focused in one place. This energetic beam of light can have chemical, mechanical, or thermal effects on the body. Lasers have been introduced to the medical field to meet patients' diagnostic and therapeutic needs faster and more effectively. Since contemporary dentistry is based on the use of minimally invasive methods, the laser can be an excellent alternative to drilling due to less pain, noise, and vibration (Figs. **1a - c**) and can be used to diagnose and prevent dental diseases and can also help maintain the remaining healthy structures by removing diseased tissues (decayed tissues).

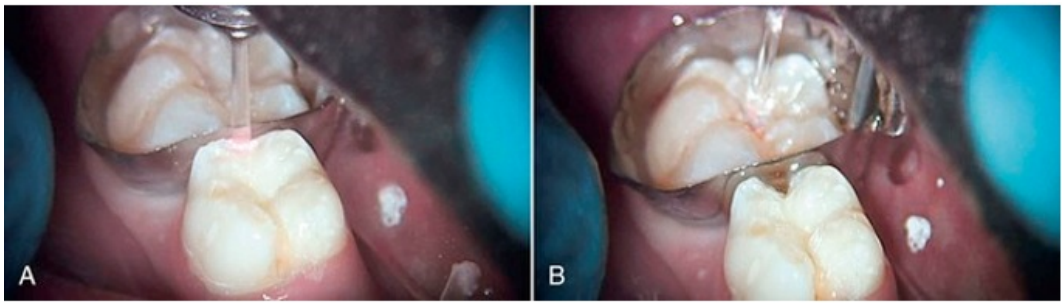

Fig. (1a). A, Class II caries. Matrix band is placed on the adjacent tooth to prevent accidental removal of its structure. **B,** Class II caries removal with Er: YAG laser.

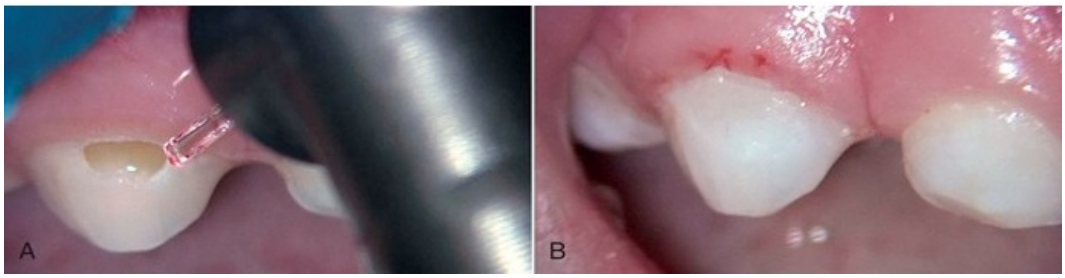

Fig. (1b). A, Class V caries removal combined with access gingivectomy. Both procedures were completed with an erbium laser: **B,** Immediate postoperative view of restoration.

Fig. (1c). Class III caries removal on permanent central incisors with erbium laser.

Maintaining a dry mouth increases the doctor's vision and induces better results. In addition, the replacement of sharp tools with lasers attracts more patients to dental clinics. The American Academy of Pediatric Dentistry (AAPD) recommends using lasers in restorative dentistry and soft tissue therapy for infants and children, including patients with special health needs. Other benefits of using a laser in dentistry are listed in Table **1**.

Table 1. Other clinical benefits of laser.

Minimal invasiveness	**Useable for carious tissues**
Antiseptic effects	Useable in carious and root canal lesions
It has a Micro retentive surface.	Useable in rough, clean, and deformed surface without smear layer
Application in soft tissues	Useable in carious gums near the proximal surface, evaporating and thickening the pulp.

CHAPTER 13

Genetic Aspect of Dental Diseases

Abi M. Thomas[1,*], Niraja Gupta[2], Madulika Kabra[2] and **Prachi Goyal[3]**

[1] *Christian Dental College Ludhiana, Ludhiana, Punjab 141008, India*

[2] *Division of Medical Genetics, Department of Pediatrics, AIIMS, New Delhi, India*

[3] *M.M. College of Dental Sciences & Research, MMU, Mullana, Haryana, India*

Abstract: Genetics is the study of genes at all levels from molecules to populations. Common dental diseases such as dental caries, periodontal disease and malocclusion are influenced by environmental factors. However, even in these diseases, the genetic aspects that influence the degree of susceptibility should not be overlooked. Dental practitioners would find value in understanding the genetic contribution to caries risk as they would be able to explain to patients that some forms of decay are more strongly associated with inherited risk and these patients could be monitored more closely and provided with more aggressive preventive programs.

Keywords: Chromosome, Dental diseases, Genetic counselling, Genetics, Syndromes.

INTRODUCTION

Genetics is the study of genes at all levels from molecules to population. The term gene is referred to as a basic unit of heredity lying in chromosomes. Each gene is responsible for a specific trait or character of an individual. There are hundreds and thousands of genes responsible for specific functions in an individual.

The transmission of characters through generations is determined by genes located on the chromosomes. The genotype of an individual indicates the characters transmitted through the genes. The physical expression of these characters is designated as phenotype. Autosomal characters are borne by autosomes (22 pairs of chromosomes) and sex-linked chromosomes. Genes are located at chromosome loci as alleles. Two different alleles at a particular locus of a chromosome indicate heterozygosity, whereas identical alleles at a locus indicate homozygosity. Males with the expression of X-linked characters

[*] **Corresponding author Abi M. Thomas:** Christian Dental College Ludhiana, Ludhiana, Punjab 141008, India; E-mail: abithomas@gmail.com

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(unpaired alleles) are termed hemizygous. A dominant character is defined as one whose phenotypic expression is possible in the heterozygous state. A recessive character manifests only in the homozygous state. A disorder caused by a gene on any of the 22 pairs of autosomes has autosomal inheritance, while a disorder caused by any gene on one of the sex chromosomes shows sex-linked inheritance. Drawing and interpreting H a pedigree is an integral part of the diagnosis of single-gene disorders.

Four major patterns of genetic transmission are possible:

1. Autosomal dominant (AD)

2. Autosomal recessive (AR)

3. X-linked dominant (X-L-D)

4. X-linked recessive (X-L-R)

Genetics and Dentistry

The successful completion of the Human Genome Project in 2000 led to the development of new tools for human genetic studies. These tools have been widely applied to many human traits of complex etiology. The three most common problems in dentistry are dental caries, periodontal problems, and malocclusion, all of which have a multifactorial etiology. But the role of hereditary factors in these diseases has been better understood with the help of these tools. Also, understanding the role of human traits in orofacial clefts, growth and development disorders and syndromes is important in the management of such disorders. In the past, lack of evidence of any clear-cut single gene defects has been met with many difficulties in managing many of these disorders. Despite this, twin studies, molecular genetic technology, gene mapping techniques, *etc*. are now providing approaches for locating various genes associated with various diseases and disorders. Pursuing oral health in childhood, the clinician can observe various abnormalities and intervene early to remedy the situation and in more complex cases, refer patients to specialists in medical genetics and or genetic counsellors. For this purpose, the clinician must have a thorough knowledge of basic genetics [1].

Chromosomal Aberrations – Classification

The basic structure of a chromosome includes a short arm “p,” a long arm “q“ and the centromere separating the two arms.

Numerical abnormalities of chromosomes include either a complete loss or gain of a chromosome so that the total number is less or more than 46. Such a defect is called aneuploidy. Aneuploidy involving autosomes is incompatible with life and most fetuses carrying them abort spontaneously. Babies alive have a variable degree of malformations and neurodevelopmental abnormalities. These are sporadic events with low recurrence risk. If a complete set of chromosomes is duplicated, then it is known as polyploidy. Being euploid (2n) is the normal state. Structural rearrangements are balanced, *i.e.*, there is no loss of genetic material. Sometimes, during meiotic rearrangements, unbalanced gametes may be produced. Embryos from such gametes are either aborted or have postnatal anomalies and malformations.

Structural Abnormalities

Such structural abnormalities (Fig. **1**) include:

- **Inversions** may occur around the centromere (pericentric) or involve one arm only (paracentric).
- **Translocation** between 2 non-homologous chromosomes is either reciprocal involving a mutual exchange or Robertsonian which is a special translocation involving chromosomes 13, 14, 15, 21 and 22.
- **Deletion:** Breaking away from the loss of a portion of a chromosome e.g., Cri-du-chat syndrome.
- **Duplication:** An over-representation of the specific chromosomal region.
- **Isochromosome** is formed when there is a loss of one arm with duplication of the other arm of the chromosome.
- **Mosaicism** is the occurrence of two distinct cell lines arising from a single zygote due to early mitotic errors of replication.

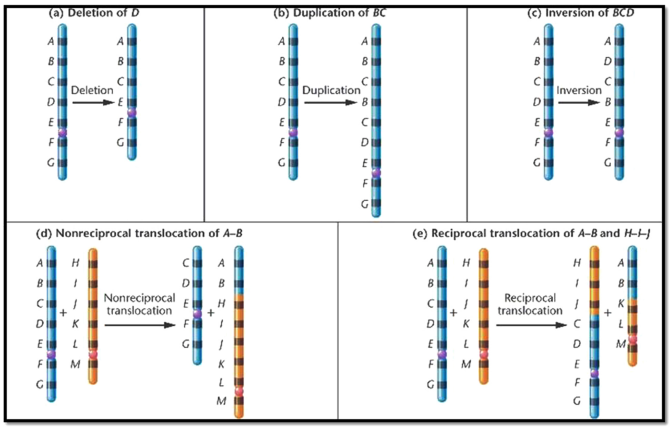

Fig. (1). Structural abnormalities in the chromosomes.

CHAPTER 14

Probiotics and Oral Health

N. Venugopal Reddy[1,*], Dhanashree Sakhare[2] and **Parag D. Kasar[3]**

[1] *Mamata Dental College & Hospital, Khammam, Telangana 507002, India*

[2] *Lavanika Dental Academy, Melbourne, Australia*

[3] *Deep Dental Clinic, Navi Mumbai, Maharashtra 400706, India*

Abstract: Humans are host to oral microbiomes in a positive relationship which is a critical determinant for regulating oral symbiosis. When the balanced condition is transformed into an acidic environment, the percentage. mutans streptococci and Lactobacillus species increase. However, to be beneficial in the oral cavity, probiotics must first aggregate and attach to the oral tissue, creating a protective barrier to prevent the colonisation of the pathogenic microorganisms. The growth and activity of probiotics are enhanced by nondigestive oligosaccharides, namely, prebiotics, which cannot be digested by the host but enhance the beneficial effects of probiotics by selectively stimulating the growth and activities of the probiotics.

Keywords: Oral diseases, Oral Health, Probiotics.

INTRODUCTION

Humans are a unique reservoir of a heterogeneous and vivacious group of microbes, forming the human-microbiome superorganism.

The emergence of microbiota with resistance and tolerance to existing conventional drugs and antibiotics has decreased the drug efficacies. Health professionals are aware of the rapid pace of changing health care.

Furthermore, the modern ergonomics-med nano-encapsulated multiplex supplements appear to be high cost and problematic. Henceforth, a simple, low-cost, responsive, and intrinsic approach to achieving health benefits is vital in the present era, which is imparted by probiotics and prebiotics as well as synbiotics and have been the subject of extensive research in the past few decades [1].

[*] **Corresponding author N. Venugopal Reddy:** Mamata Dental College & Hospital, Khammam, Telangana 507002, India; E-mail: drnvenugopalreddy@gmail.com

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Probiotics, live microbial food supplements that beneficially affect the host by improving its intestinal microbial balance, are quickly gaining interest as functional foods in the current self-care and complementary medicine [2].

Terminologies

PREBIOTICS Glenn R. Gibson, in 2017 introduced the concept of prebiotics. Prebiotics are primarily fibers that are non-digestible food ingredients and beneficially affect the host's health by selectively stimulating the growth or activity of some genera of microorganisms in the colon, generally lactobacilli and Bifidobacterium [3].

WHO defines prebiotics as a non-viable food component that confers health benefits on the host associated with microbiota modulation [1].

PROBIOTICS

Ferdinand Virgin probably used the term probiotics. He invented the term "probiotic" in 1954, in his article entitled "Anti-und Probiotics", comparing the harmful effects of antibiotics and other antibacterial agents on the intestinal microbiota with the beneficial effects ("probiotics") of some beneficial bacteria. When he studied the detrimental effects of antibiotics and other microbial substances on the gut microbial population, it was first used by Lilly and Stillwell in 1965 to describe "substances secreted by one microorganism which stimulates the growth of another" and thus was analogised with the term antibiotic [3].

Parker (2008) defined probiotics as "organisms and substances contributing to intestinal microbial balance." Retaining the word substances in his definition of probiotics resulted in a wide association that included antibiotics.

According to Salminen (1998), a probiotic is "a live microbial culture or cultured dairy product that beneficially influences the host's health and nutrition." According to Schaafsma (1998), "Oral probiotics are living microorganisms that exert health effects beyond inherent basic nutrition upon ingestion in certain numbers".

The currently used definition approved by WHO and FAO in June 2014 is "Probiotics are living microorganism which, when administered in adequate amounts, confer a health benefit for the host" [3].

Postbiotics

In the absence of viable organisms, bacterial products may have similar effects on signalling pathways and barrier function. These bacterial products are broadly

characterised as postbiotics. They can be defined as non-viable bacterial products or metabolic by-products from probiotic microorganisms with biological activity in the host. For practical reasons, probiotics and prebiotics have been described as conbiotics by specific authors and symbiotic by others.

Synbiotics

It is the interaction between probiotics and prebiotic effects in the Gastrointestinal tract. It has a more beneficial impact on human health than alone. It recovers the intestinal microbial environment and activates the host immune function, preventing bacterial translocation. It is safe, convenient & straightforward as a food supplement.

History of Probiotics

Probiotics are microorganisms, mainly bacteria, which benefit the host's health. Many studies support the role of probiotics as a contributor to gastrointestinal health, and nowadays, many authors are trying to prove their influence in oral health maintenance. To review the published literature to know the importance of using probiotics as a preventive and therapeutic method for oral infectious diseases management.

Before the existence of microorganisms, it was believed that bacteria played a pivotal role in dairy products such as kefir, koumiss, lin, en and yoghurt; sacred milk was often used therapeutically. The concept of 'probiotics' evolved in the 20th century from the ideas of Russian Nobel Prize laureate Elie Metchnikoff, professor at Pasteur Institute in Paris, that the bacteria in fermented products could compete with microbes detrimental to the host and thus can be beneficial for health [3]. Elie Metchnikoff reported that Bulgarians lived longer than other nations and supposed that this was because they consumed fermented milk products containing viable bacteria. Lactic acid lowers gut pH and inhibits the growth of some pathogenic bacteria. Later in 1950, a probiotic was trailed for scouring treatment among pigs, which led to a successful result. In 1974 another turning point about the probiotics was found by Mann and Spoering. They discovered that blood serum cholesterol could be reduced by fermented probiotics [4].

The first probiotic species introduced were *Lactobacillus acidophilus* by Hull in 1984 and Bifidobacterium bifidum by Holcomb 1991. Henry Tissier at Pasteur Institute identified a bacteria common in breastfed infant stool Bifidobacterium. More than 100 years ago, W.D. Miller gave the first accurate understanding of the dental caries process by demonstrating that it was a bacterially-mediated process. WHO described probiotics in 1994 as the next most important in the immune

CHAPTER 15

The Setting of a Pediatric Dental Clinic

Nilima Thosar[1,*] and **Prachi Goyal**[2]

[1] *Department, of Pediatric and Preventive Dentistry, Sharad Pawar Dental College and Hospital, Datta Meghe Institute of Medical Sciences (Deemed to be University), Wardha-442107, India*

[2] *Department of Pediatric and Preventive Dentistry, MMCDSR, Mullana (Ambala), India*

Abstract: Pediatric Dental Clinic should be colourful and pleasantly full of colours and lights. Pediatric patients should like the ambit of the environment. So, the setup of a Pediatric dental clinic should consider the interests and likes of pediatric patients. The clinic should have designated areas for the clinical work of patients. There should be a separate clinical area, waiting area, and play area.

Keywords: Dental Clinic Set up, Pediatric Patient.

INTRODUCTION

Pediatric Dentistry is the speciality concerned with the dental treatment of children. It is rightly said that a "Child's mind is tender and lovely as the petals of a full-blown rose. Beware how you touch it. Meet it with all reverence of your being. Use it with gentle respect and fill it with the honey of love, the perfume of faith, and the tenderness of tolerance."

For the child to like the environment of the Pediatric dental setup, it should be pleasant. Children should not feel bored and restless at any moment. It should be constructed to give the child patient a sense of relaxation and comfort. Dentistry for children is not complex but is different from that for adults. So, the same dental setup also differs accordingly.

Mohammad Karimi, 2018 [1] suggested that dental office setup and environment require knowledge about the science of colour and lighting design; the correct layout is needed.

[*] **Corresponding author Nilima Thosar:** Department,of Pediatric and Preventive Dentistry, Sharad Pawar Dental College and Hospital, Datta Meghe Institute of Medical Sciences (Deemed to be University), Wardha-442107, India; E-mail: drnthosar@rediffmail.com

Factors to be Considered for Pediatric Dental Set-Up

The design of the Pediatric Dental clinic setup is different as various aspects need to be taken into consideration, such as behaviour management understanding of child psychology as some children have inherent fear and anxiety or it may be related to family/parent/ society related influencing factors causing the fear in the child. Pediatric Dentistry is an age defined as from birth up to adolescent children visiting a dental clinic for their dental problems. A child's first dental visit is an extraordinary task for a Pediatric Dentist who is responsible for creating a positive dental attitude not only in children but also in parents of younger children (Fig. **1**).

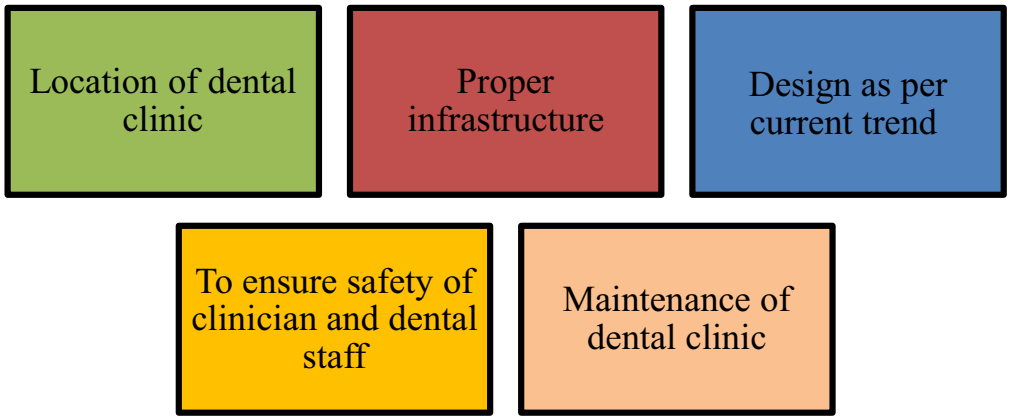

Fig. (1). Factors to Be Considered for Pediatric Dental Set-Up.

Nowadays, dental practitioners want to develop dental setup designs taking into consideration the following points such as:

Pediatric Dental setup requires knowledge of interior decoration of office, lighting, and proper layout of dental equipment.

Space utilisation for dental setup requires the provision of the following areas [1]:

1. Reception area
2. Waiting area
3. Playroom
4. Dental office set up
5. Audio-visual aids
6. Dentist's private office
7. Examination room
8. Treatment room

9. Radiography room
10. Central Sterilization room
11. Dental laboratory
12. Area for biomedical waste management

Reception Area

The reception area in the dental clinic is where the child enters first. The receptionist always should address the child with a smile so that child should not feel that they have visited an unknown area. It is the first area that attracts the child. So, this area welcomes the child to the Pediatric Dentistry Department/ Dental clinic. In general, the admission section should convey inviting and welcoming. The office clerk can fill in the required information about the child in various ways like using questionnaires and recording their responses and computerised entry of patients' data (Fig. **2**).

The receptionist should possess communication skills. She can call the patient by their name, preferably by the nickname, so the child feels that the receptionist is their friend who may help develop rapport. The receptionist can engage the child in topics of interest, which can help relieve the child's anxiety.

Fig. (2). Reception area of a Pediatric dental clinic.

CHAPTER 16

Child Abuse and Neglect

Vishwas Chaugule[1,*], **Vishwas Patil**[2] and **Bhagyashree Shetty**[3]

[1] *Ex Professor, Department of Paediatric and Preventive Dentistry, Sinhgad Dental College and Hospital, Pune, India*

[2] *Ex Professor, Department of Paediatric and Preventive Dentistry, Dr. D.Y. Patil Dental College and Hospital, Pimpri, Pune, India*

[3] *Junior Research Officer, Pune, India*

Abstract: Child abuse and neglect are synonymous with the current term "Child maltreatment", a multifactorial problem affecting the health and well-being of large numbers of children worldwide. "Child Abuse and Neglect" has been discussed from public health and a professional perspective, focusing on global problems. It narrates the consequences of being exposed to this form of brutality on the minds and bodies of the child, their detection and measures being taken to prevent these types of violence. Also, the extent of the problems, the risk factors, the consequences of child abuse, and what is being done to avoid child abuse and neglect have also been discussed.

Keywords: Child Abuse, Dental Neglect, Emotional Abuse, Physical Abuse.

INTRODUCTION

Child abuse is a state of emotional, physical, economic, and sexual maltreatment meted out of a person below the age of eighteen and is a globally prevalent phenomenon. The growing complexities of life and the dramatic changes brought about by socioeconomic transition have played a leading role in increasing the vulnerability of children to various and new forms of abuse. It has severe physical and psycho-social consequences that adversely affect a child's health and overall well-being.

One of the significant problems in understanding the scope of the subject of "Child Abuse and Neglect" is that it is tough to get a response from children on such a sensitive issue because of their inability to understand the different dimensions of child abuse and to talk about their experiences.

[*] **Corresponding Author Vishwas Chaugule:** Department of Paediatric and Preventive Dentistry, Sinhgad Dental College and Hospital, Pune, India; E-mail: vbchaugule@gmail.com

As health guardians, the medical and dental fraternity should plan and concentrate their efforts on addressing child abuse and neglect. "Be human and stop child abuse" should be a motto to change children's prospects of safety and well-being.

Definitions

The term "Child abuse" may have different interpretations in the unfamiliar cultural milieu and socioeconomic situations. A universal definition of child abuse in the global context does not exist and needs to be defined.

Child Abuse

WHO, in 1999, defined child abuse as a violation of the fundamental human rights of a child. It includes all forms of physical, emotional ill-treatment, sexual harm, neglect, negligent treatment, commercial or other exploitation, and the likelihood of harming the child's health, survival, or dignity in a relationship of responsibility, trust, or power [1].

Child Maltreatment

WHO, in 2006, defined child maltreatment as all forms of physical and emotional ill-treatment, sexual abuse, neglect, negligent treatment or commercial or exploitation, resulting in actual or potential harm to the child's health, survival, development, or dignity in the context of a relationship of responsibility trust or power [2].

Types of Abuse

Physical Abuse

The WHO (2006) defines child physical abuse as the intentional use of physical force against a child that results in or has a high likelihood of harming the child's health, survival, development, or dignity. This includes hitting, beating, kicking, shaking, biting, strangling, scalding, burning, poisoning, and suffocating. Much physical violence against children in the home is inflicted with the object of punishment [2].

Warning Signs of Physical Abuse

The child may:

- Have frequent injuries or unexplained bruises, wounds, or cuts. Their injuries may have patterns such as marks from a hand or belt (Fig. **1**).

- Be constantly watchful and "on alert," as if waiting for something terrible to happen.
- Shy away from touch, flinch at sudden movements, or appear to be afraid to go home.

.

Fig. (1). Physical abuse.

Emotional Abuse

Emotional and psychological abuse involves both isolated incidents and a pattern of failure over time of a parent or caregiver to provide a developmentally proper and supportive environment. Acts in this category may have a high probability of damaging the child's physical or mental health or mental, spiritual, moral, or social development. Abuse of this type includes the restriction of movement; patterns of belittling, blaming, threatening, frightening, discriminating against or ridiculing; and other non-physical forms of rejection or cruel treatment [2].

Warning Signs of Emotional Abuse

The child may:

- Be excessively withdrawn, fearful, or anxious about doing something wrong.

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Satyawan Damle

Professor Damle is a colossus giant, a celebrated teacher, distinguished leader, and policy-maker at several institutions and universities. He is the rare blend of a clinician and a scholar and has emerged with decades of teaching. He possesses more than 44 years of teaching experience. He was the Dean of Nair Hospital Dental College, Mumbai, for 13 years, also has been a postgraduate teacher for 30 years. He remained Director of Medical Education. He was the first Dental Surgeon promoted as Joint Municipal Commissioner, Medical Education. Prof. Damle is actively involved in research and has numerous publications in Indian and International journals.

Ritesh Kalaskar

Presently working as Professor and Head of the Department of Pediatric Dentistry at Government Dental College and Hospital Nagpur, Dr. Ritesh Kalaskar is a very well-known teacher and academician and has published nearly 70 scientific papers and 3 patents. Also, he is a recipient of the Best teacher award, awards for excellence in academics and research and a recipient of several Journals. He has been a member of organizing teams in various capacities to organize national and international conferences.

Dhanashree Sakhare

Dr. Dhanashree Sakhare has been enthusiastically involved in teaching and research activities with wide-ranging experience working in India at MM College of Dental Sciences & Research, Mullana. She was a lecturer of Orthodontics and then worked as an associate professor of Orthodontics & Dentofacial Orthopedics Currently, she is actively pursuing Australian Dental aspects and teaching aspirant overseas dentists in Australia. She has won best paper awards, delivered several lectures, and demonstrated clinical presentations at various Dental conferences. She has numerous publications to her credit.